REPORT

OF THE

PROCEEDINGS

OF THE

ELEVENTH ANNUAL BLISTER RUST CONFERENCE

HELD IN

SPRINGFIELD, MASSACHUSETTS

DECEMBER 9 - 10, 1925.

INDEX TO PAPERS

9. Preliminary report on efficiency and cost of different sized eradication crews - J.E. Riley, Jr.

10. Recent damage studies in New York - - - - - - - - - - - - - - - - Dr. H.H. York.

11. Scientific investigations - - - - - - - - - - - - - - - - - Dr. Haven Metcalf.

The papers will be short. Time will be allowed for thorough discussion of the subjects on the program and such additional topics as may be brought up in the meetings.

PROGRAM

ELEVENTH ANNUAL BLISTER RUST CONTROL CONFERENCE

Parlors A.B.C. - Hotel Kimball
December 9 and 10, 1925
Springfield, Mass.

- - -

Wednesday, December 9.
10:00 a.m.

ADDRESS - Cooperation Leads to Success - - - - - - - - - - H. A. Reynolds

1. Progress of the control campaign in the Eastern States -- E. C. Filler

Open Round Table Discussion
Suggested Topics

(a) Ways and means of completing the initial eradication of Ribes in each State ----------State Cooperators and State Leaders.
(b) The need and character of re-eradication work following the primary eradication of Ribes ----State Cooperators and State Leaders.

2:00 p.m.

2. Observations on cooperative blister rust control work - Dr. J. F. Martin.

Open Round Table Discussion
Suggested Topics

(a) Use and value of blister rust educational materials ---L. E. Newman. (Meetings, demonstrations, exhibits, news items, posters)
(b) Improvement of service features of control work - - - - A.F. Amadon. (Securing Ribes eradication, checking, follow-up work, records.)
(c) Development of effective cooperation in extension and blister rust control work - - - - - - - - State Extension Directors.

Thursday, December 10
10:00 a.m.

3. Blister rust situation in Canada - - - - - - - - - Dr. A. W. McCallum.

4. Results of scouting in the Middle Atlantic and Lake States-Dr.J.F. Martin.

5. Spread of blister rust in the Eastern United States -Dr. L.H. Pennington.

6. Value of data on the use of white pine and other woods in blister rust control - - - - - - - P. H. Merrill & O.C. Anderson.

7. A study of ribes eradication in the control of blister rust-W.J. Endersbee.

2:00 p.m.

8. Description of experimental work underway at North Hudson,N.Y.- A.E. Fivaz.

9. Preliminary report on efficiency and cost of different sized eradication crews - - - - - - - - - - - - - - - - - - - J.E. Riley,Jr.

10. Recent damage studies in New York - - - - - - - - - - - - - - - - Dr. H.H. York.

11. Scientific investigations - - - - - - - - - - - - - - - - - Dr. Haven Metcalf.

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COOPERATION LEADS TO SUCCESS

By
H. A. Reynolds,
Secretary, Massachusetts Forestry Association.

"You men are to be congratulated on the success of your work in the control of the white pine blister rust. It has been a great source of satisfaction to follow this work closely and to note the progress that you make from year to year. Your success has also been a source of pride to me, because I was responsible for calling the first meeting to consider this matter, and it resulted in funds being provided for the suppression and control of the rust. That meeting resulted in the formation of a committee known as the Interstate Committee for the Suppression of the White Pine Blister Rust. Since then, that Committee has passed through various reorganizations and has traveled under different names, but the one that has stuck the longest is the American Plant Pest Committee. The Committee has aided this work in every way possible and is justly proud of the results that have been accomplished in controlling this serious disease.

"Your success has been threefold. First, you have succeeded in controlling this disease in so far as funds and time has permitted. You have had many extremely difficult problems which have taxed your ability and patience but in no case to my knowledge have you failed to meet them.

"In the second place, you have demonstrated what personal contact will do with a problem of this kind. You have not only shown the timberland owners why and how they must save their pine from this particular disease, but the efforts of your local agents in controlling blister rust has resulted in interesting whole communities in the forestry problem. To my mind your work has contributed much toward the development of farm forestry extension. My idea of farm forestry extension is not merely

the giving of lectures and the publication and distribution of bulletins, but the stimulation of actual work on the ground by the timberland owners.

"While your program is supposed to cover a period of eight years and from all appearances you will have covered most of the ground once in that time, I do not believe that this organization can be disbanded at the end of that time. Either it must be continued in its present form or the work be taken over by an equally efficient organization. We cannot hope to educate the great mass of small woodland owners to continue the care of their pine lots in the period of eight years.

"Thirdly, you have demonstrated a principle of federal cooperation which I believe should be the basis of all aid to the States. I can remember several years ago when many of us thought the only way to handle the problem was to have the Government pay the whole bill and do all the control work. You have proved absolutely that the only real help pine owners need in a matter of this kind is to be shown why the job is necessary and how to do it. Since your problem is national in scope, cooperative federal and State leadership and organization of the work in a manner that not only demonstrates methods, but also gets individuals and communities to carry them out, is essential if the general application of control measures in the white pine regions is to be accomplished. It seems to me that you have proven conclusively the value of Government help in problems of this kind and every effort should be made to continue this work to an ultimate conclusion.

P A P E R S

on

C O N T R O L A C T I V I T I E S

PROGRESS OF COOPERATIVE CONTROL PROGRAM IN THE EASTERN STATES

By E. C. Filler

Bureau of Plant Industry, U. S. Department of Agriculture

The results accomplished in blister rust control, since the eight year program was initiated in June 1922, have proved the practicability of the present policy. During the period 1922-1925, a total of 3,217,140 acres in New England and New York have been cleared of 29,783,638 wild and 204,451 cultivated Ribes at a per acre cost of 13 cents. This acreage is over three times as much area as covered during the four-year experimental period prior to 1922. In the application of control measures, 12,437 individual cooperators have expended $152,900.45. In addition $146,213.89 has been expended from 460 town appropriations in four states. Several thousand additional persons have cooperated by destroying their cultivated bushes without compensation, or in other ways aiding the cooperative work.

During the period July 1922 - December 1925, the blister rust control agents in New England and New York have given talks at 2307 meetings attended by 154,405 persons, held 2379 field meetings at which 15,136 people were present, placed 2283 exhibits, distributed 210,889 publications, published 4,079 news items, and placed 31,761 posters. In addition, 50,754 initial interviews and 21,663 follow-up calls were made while 14,470 persons were instructed in the characteristics of the disease and damage, and 8,711 individuals were shown control measures. In the course of their regular duties, the agents activities have also had a good effect in stimulating a keener public interest in forestry.

Since the beginning of control work in 1917, a total of 45,410,459 wild and cultivated bushes have been eradicated in New England and New York from

4,516,605 acres, a section nearly equal to the entire land area of the state of Massachusetts. Accurate cost figures, kept since 1918, show the per acre cost has averaged 22.4 cents on 4,248,633 acres.

These results speak for themselves. We can justly feel proud of this good record. But, is sufficient progress being made to accomplish the objective of our program; namely, the initial eradication of Ribes from the white pine areas and protection strips in the Northeastern States by 1930? At the 1924 conference, Mr. Detwiler read a paper which set our goal at 1-1/2 million acres per year. During 1925, a total of 834,428 acres were cleared of Ribes, exclusive of 466 acres worked in the White Mountain National Forest. This is a commendable accomplishment, yet the area worked is 17.2% less than the preceding year and we traveled only about half way toward our yearly goal.

I will attempt to show the present status of our control work by the following table:

Table I. Status of Initial Ribes Eradication Work in The Northeastern States

State	Estimated Acreage White Pine Growth	Total Acreage Eradicated of Ribes 1917-1925	Acreage Eradicated of Ribes in 1925	Estimated Pine Acreage Protected	Percent Pine Acreage Protected	Pine Acreage Still to be Protected	Total Area Still to be Eradicated	Eradication Seasons to Complete Initial Project	Yearly Acreage Needed to Complete Project	Ratio of Necessary Annual Acreage to 1925 Acreage
Maine	3,000,000	1,386,432	274,034	924,283	30.8	2,075,712	3,113,568	4 2/5	707,629	2.5 Times
N.H.	2,500,000	1,587,556	219,976	1,058,371	42.3	1,441,629	2,162,443	4 2/5	491,464	2.2 "
Vermont	86,000	112,621	25,227	37,540	43.6	48,460	145,380	4 2/5	33,041	1.3 "
Mass.	775,000	783,583	190,945	391,791	50.5	383,209	766,418	4	191,604	1.003 "
Conn.	*190,000 **75,000	67,930	13,308	45,287	60.4	29,713	44,570	2	22,285	1.67 "
R.I.	125,000	232,425	25,640	116,212	93.0	8,788	17,576	1	17,576	.68 "
New Eng.	6,676,000	4,170,547	749,130	2,573,489	38.7	3,987,511	6,249,955	4 2/5	1,463,599	1.95 "
New York	1,500,000	285,034	34,937	190,025	12.7	1,309,975	1,964,962	4 2/5	492,037	14.1 "
New Eng. & N.Y.	8,176,000	4,455,581	784,067	2,763,514	33.8	5,297,486	8,214,917	4 2/5	1,955,636	2.48 "

* State. **Litchfield County.

In analyzing table #1, the following facts should be noted:

1. No re-eradication work is considered. This item is becoming increasingly important and amounted to 50,400 acres during 1925. This accounts for the difference in the total acreage figures for 1925 listed on the preceding page and in column four of the above table. Also in Connecticut during 1925, 427 acres were cleared of Ribes outside of Litchfield County.

2. The acreage of white pine growth is merely an estimate made by state officials. Only two states - Connecticut and Rhode Island have made definite pine surveys. In Vermont and New Hampshire fairly accurate figures have been secured from general surveys. Planting is increasing the pine acreage in several states, especially New York.

3. The acreage eradicated of Ribes includes protection strips in addition to pine areas, also a small amount of re-eradication work prior to 1923.

4. The pine acreage protected in each state is based on an estimated percentage of the total area cleared of Ribes as follows:- 66 2/3% in Maine, New Hampshire, New York, and Connecticut; 50% in Massachusetts and Rhode Island; and 33 1/3% in Vermont. (The smaller the pine areas the larger the proportionate protection zones).

5. The total area still in need of Ribes eradication is based on a percentage of the total being added for protection strips as follows:- 33 1/3% in Maine, New Hampshire, New York, and Connecticut; 50% in Massachusetts and Rhode Island; and 66 2/3% in Vermont.

6. In Connecticut, outside of Litchfield County, most of the pine is naturally protected from blister rust. However, in this county, there is about 75,000 acres which require protection.

According to the above table, it will take four states - (Maine, New Hampshire, New York, and Vermont) the full remaining 4-1/2 years of the eight year control program to complete the initial eradication of Ribes from pine areas needing protection. But, to accomplish these results, Maine must cover during 1926, 2.5 times as much acreage as worked in 1925 and maintain this same rate of progress during the next five years, while in New Hampshire, Vermont, and New York, the rate of increase must be maintained at 2.2, 1.3, and 14.1 times respectively the 1925 figures. If Massachusetts maintains its 1925 rate of control work, the initial eradication of Ribes can be completed in this state within four years. Rhode Island and Connecticut can finish their initial project in one and two years respectively. However, it will be necessary for Connecticut in Litchfield County to cover each year 1.35 times as much area as worked in 1925.

In all states there is a varying amount of re-eradication work needed. Surveys need to be made in the Northeastern States to determine Ribes conditions now existing on the control areas of 1917 to 1920, comprising 922,720 acres. Some of the areas will only require scouting,

but where Ribes were originally abundant, it may be necessary to re-work them with crews. Our eradication work must before long include adequate measures to cope with the re-growth of Ribes on control areas. In the various states the acreage of early control areas range from a few thousand acres in Connecticut to 408,487 acres in New Hampshire. Some way of handling this problem must be determined upon in the near future.

Results of Control Work During 1925.

The 1925 Ribes eradication season was a most unusual one. An excessive amount of rainy weather frequently prevented field work and in many cases indefinitely postponed cooperative projects. The early defoliation of Ribes brought field activities to a close about two weeks ahead of normal. A slump in cooperative town funds also curtailed the work in some states. In some areas scouting revealed less need for crew work than usual, consequently state expenditures by individuals was correspondingly decreased. The control work for 1925 can be most readily summarized if divided into four classes:-

(1) Town Cooperation

A total of 132 towns in Maine, New Hampshire and Vermont expended $40,351.31 in eradicating Ribes. In New Hampshire 251.669 acres were worked in cooperation with towns. This acreage represents 30.1% of the total area covered in the Northeastern States during 1925. In Vermont and Maine town funds were used to cooperate in Ribes eradication with individuals while in New Hampshire the town is the cooperating unit. Compared with the previous year, decreases occurred in the 1925 town projects as follows: Number of towns appropriating - 10.2%, amount of town money expended - 15.9%, acreage eradicated (N. H.) - 19.8%

Service Activities by Permanent Agents

(January 1 - September 30, 1925)

Table III.

		Initial Interviews	Follow-up Calls	Individual Instruction	
				Control Methods	Disease
Totals for All Agents		9110	5478	2891	4355
Lowest State Ave. Per Agent		95.5	36.0	8.0	35.5
Highest State Ave. Per Agent		523.6	233.0	146.8	209.7
Ave. Per Agent (All States)	1925	257.4	147.8	81.7	123.0
	1924	293.2	146.2	36.6	45.2
Daily No. per Agent	1925	1.12	.65	.36	.54
	1924	1.28	.64	.16	.2

In analyzing table III, the wide range in the amount of service work in the various states is likewise conspicuous. In comparing the results of the two years, commendable increases are noted during 1925 in the number of individuals instructed in the disease and control measures, but a decrease appears in the number of initial interviews. As cooperation in Ribes eradication is the direct result of service work, no decreases should occur here. Can we be satisfied with an average of only 1.1 initial interviews and .6 of a follow-up call per day per man? On the results of the service work depends the success of the blister rust control program.

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(2) Individual Cooperation

In New England and New York, 4027 individual cooperators expended $39,720.06 in clearing 209,461 acres of wild and cultivated Ribes. This acreage represents 25.1% of the total area worked in these states during 1925. All of this individual work except 2.7% was supervised by state men who were furnished at town or state expense, except in Vermont where the state and town money was used only to pay a part of the labor charges and the travel expenses of such men. Of the total number of individual cooperators, 953 cooperated only in removal of cultivated bushes. Comparing the 1925 work with the previous year, slight increases are noted in the number of cooperators (wild and cultivated Ribes eradication) .3%, and acreage eradicated of Ribes, 2.3%; decreases occur in number of cooperators (cultivated Ribes eradication only) 44.1%, amount of individual money expended 13%, and acreage eradicated without supervision, 22.8%.

(3) Non-cooperative Eradication Work on Private Lands

Three states - Maine, Massachusetts, and Rhode Island - conducted non-cooperative scouting on private lands containing few Ribes. In Maine 85.2% of the total acreage covered was worked on this basis, and in Massachusetts and Rhode Island 47.2% and 100%, respectively. In Connecticut 14,928 acres, or 92.6% of the total season's acreage, was worked by state crews and scouts at state expense. The total cost of all this non-cooperative eradication work in the four states listed above was $19,369.93 for destroying the Ribes on 366,763 acres. This acreage represents 43.9% of the total area worked in the Northeast during 1925. In this same year, 20.4% less acreage was worked on this basis than during 1924.

(4) State Land Projects

Ribes eradication work on state lands was performed in four states - New Hampshire, Vermont, Massachusetts, and New York. A total of 6165 acres were covered at a cost of $9647.30. Most of this work was performed in New York. The acreage eradicated on state lands represents only .7% of the total area worked in the Northeast. In 1925, 61.1% less acreage was covered on state lands than during the previous year, and 63.5% less money expended on this project.

Totals for Northeastern States

In New England and New York, a grand total of 834,428 acres were cleared of 7,296,670 wild and 59,458 cultivated Ribes at a cost of $138,491.86 or 16.6 cents per acre. The Ribes averaged 8.7 bushes per acre. In comparing the 1925 work with 1924, decreases in acreage are noted in all states except Massachusetts, New York, and Vermont. Decreases in the total figures for all states are as follows: acreage eradicated, 17.2%; wild Ribes, 22.9%; cultivated Ribes, 19.4%; and total cost, 18.2%. The per acre cost also decreased .1% during 1925, and the number of Ribes .7 of a bush per acre.

On the White Mountain National Forest, an additional 466 acres were cleared of Ribes at a cost of $284.41.

The splendid spirit of public cooperation in control work is especially shown in the eradication of cultivated Ribes. During 1925, 59,458 of these bushes were uprooted, yet the states only had to pay for 1300 Ribes or 2.2%. A total of $514.55 compensation was paid to 49 owners. In 1924, $1699.15 was expended for compensation.

The Ribes eradication work listed above is the result of successful educational and service activities. In order to more clearly understand the status of these phases of our program, the following summaries are given:

Educational Activities by Permanent Agents

(January 1 to Sept. 30, 1925)

Table II.

		Meetings	Field Dem. Meetings	Exhibits	Publications	News Items	Posters
Totals for all agents		486	136	486	55,965	1007	5233
Lowest State Ave. per Agent		4.0	0	4.0	254.0	9.0	16.0
Highest State Ave. per Agent		20.9	7.7	26.6	2452.3	39.3	293.4
Ave. Per Agent (All States)	1925	13.7	3.8	13.7	1581.0	28.4	147.8
	1924	13.4	15.6	13.2	1360.9	29.1	161.4
Monthly No. per Ave. Agent	1925	1.52	.4	1.52	175.9	3.15	16.4
	1924	1.49	1.7	1.47	151.9	3.23	17.9

Table II shows a wide range in the kind and amount of educational work. This is to be more or less expected as conditions vary in the different states. Comparing the yearly averages, slight increases are noted during 1925 in the number of meetings, exhibits, and publications distributed. On the other hand, decreases occur in the number of field demonstration meetings, news items published, and posters placed. The difference in the average monthly figures for both years is slight, the greatest being in field meetings.

Service Activities by Permanent Agents

(January 1 - September 30, 1925)

Table III.

		Initial Interviews	Follow-up Calls	Individual Instruction	
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Totals for All Agents		9110	5478	2891	4355
Lowest State Ave. Per Agent		95.5	36.0	8.0	35.5
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Daily No. per Agent	1925	1.12	.65	.36	.54
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In analyzing table III, the wide range in the amount of service work in the various states is likewise conspicuous. In comparing the results of the two years, commendable increases are noted during 1925 in the number of individuals instructed in the disease and control measures, but a decrease appears in the number of initial interviews. As cooperation in Ribes eradication is the direct result of service work, no decreases should occur here. Can we be satisfied with an average of only 1.1 initial interviews and .6 of a follow-up call per day per man? On the results of the service work depends the success of the blister rust control program.

Percent of Time Spent on Each Activity by Average Permanent Agent
(January 1 - September 30, 1925)

Table IV.

Activity		Education	Personal Service	Supervision	Scouting	Eradication	Mapping	Office	Travel
Lowest State Ave. per Agent		11.7	8.9	1.6	3.0	-	-	16.2	18.4
Highest State Ave. Per Agent		32.7	23.8	24.4	27.3	1.2	1.6	26.4	29.6
Ave. Per Agent (All States)	1925	17.6	14.3	14.9	8.7	.4	1.0	20.0	23.1
		31.9							
	1924	29.2		13.7	9.1	.5	1.0	23.7	22.5

The decrease in percentage of time spent on travel, office, and other items, and the corresponding increase in amount of time used on educational, service, and supervisory activities shows an encouraging condition.

The results of our 1925 activities are now history. In spite of our efforts, decreases have occurred in many phases of the work. This slump should not discourage us. Rather, it should spur us on to renewed energy with a determination to use our past experience as a foundation for developing more adequate plans and better organizing the work, in order to accomplish greater results during the coming year.

DISCUSSION

Mr. Newman questioned the protection strip acreage and Mr. Detwiler mentioned that the figures were entirely estimates and called his attention to the changes in forest types. Mr. Newman stated that observations in New Hampshire proved Mr. Detwiler's statement regarding the changing types. Mr. Frost also mentioned that in Maine he knew of many acres which were formerly stocked with spruce and fir where pine was now coming in.

Mr. Newman brought out the point that a decrease in amount of time spent in the office means an increase in amount of travel, as the agents were spending more time in the field.

Dr. York requested a definition of an "initial interview". After some discussion, this matter was referred to a committee consisting of the State Leaders and Mr. Filler.

OBSERVATIONS ON COOPERATIVE BLISTER RUST CONTROL WORK

By J. F. Martin
Bureau of Plant Industry, U. S. Department of Agriculture

The cooperative blister rust control campaign has made steady progress during the four years it has been underway. Those engaged upon this work have devoted themselves whole-heartedly to their task and the results of their efforts are obvious. The agents and state leaders are commended for their achievements and credit is due them for the good showing made in control work. During the past season I have studied the field work in several of the states and wish to present for your consideration the results of observations on important features of the cooperative work in the hope that they will contain suggestions of practical value. These suggestions are not intended as criticisms, but as constructive lines of thought which may assist the cooperative work.

State blister rust laws form the ground work for the control program. These laws vary somewhat in detail in the different states but are similar in scope and principle. They provide the needed regulatory authority for eradicating Ribes and prohibiting their further cultivation in control areas. In a few cases recourse to the state law has been necessary to secure the removal of cultivated Ribes, but in no instance, so far as I know, has it been necessary to invoke the law for the removal of wild Ribes. Usually a proper educational effort and the fact that adequate legal power is known to exist is sufficient to produce the desired result. Blister rust regulatory authority has never been used in an arbitrary manner. It has always been wisely administered. In dealing with the individual, state leaders and agents should continue to use the state regulatory power only as a last resort.

They should give careful thought and effort to developing methods of gaining the individual's cooperation without the use of the law. Compulsion creates antagonism and the success of our work depends absolutely upon the friendly cooperative attitude of the public. Each one of us should keep this firmly in mind.

Since the beginning of the control program a great deal of thought and emphasis has been given the educational features of the work. This phase of the problem now appears to be well developed as to quantity and variety of material available. In the past, the agent has been encouraged to use a large amount of educational material with the result that sufficient thought has not always been given to its local utilization and application. The agent is the leader of the cooperative control work in his district and the selection and application of educational material should be left to his judgment. The state leader should keep informed on the extent and manner in which the material is used and give suggestions for improvement.

Since the agent has a detailed knowledge of conditions in his district, he knows where a blister rust meeting will give results, where posters can be placed to advantage, where a roadside or field demonstration will be effective, where circular letters and publications will get results and where interviews will produce cooperators. In other words, the agent is best equipped to select the type of educational material suited to his needs and to apply it in the most effective manner. To do this, he must give careful forethought to the kind of blister rust educational work required in his district and to the time and place for its use. The haphazard or indiscriminate use of such material will result in wasted energy and may even be so interpreted as to cause public disapproval.

The regulatory and educational features are essential parts of the control program, but their function is primarily to make feasible the service feature of the cooperative work. Between these three features there must be proper coordination and balance. State laws make possible the eradication of Ribes and regulation of their further cultivation and movement within the State, while education secures the attention of pine owners, stimulates their interest and prepares their mind for control work. The service feature accomplishes actual control of the rust in definite areas through proficient leadership, systematic personal contacts, adequate organization and supervision of cooperative Ribes eradication and persistent checking to guarantee effective work. It is on this feature of the co-operative control work that the agent appears to need more constructive assistance and guidance. In giving more attention to the educational side of the work, the service feature has not in all cases been given the proportionate consideration and study its importance warrants.

Service is the core of the cooperative control work. By means of it we obtain the eradication of Ribes. The extent to which Ribes are eradicated is influenced by the agent's knowledge and skill in conducting his work. As a basis for his knowledge, he must determine the materials and conditions in his district with which he must work, and study their relation to his problems. The skill with which he applies his knowledge will be governed by the manner in which he plans and carries out his work. By plan is meant an arrangement of the steps to be taken for the attainment of a definite object; in this case the eradication of Ribes in definite areas. The plan should be simple. It must, however, be built to fit local conditions. You cannot make local conditions fit the plan.

From time to time the agents have been urged to definitely plan their work and sample outlines were provided for this purpose. In doing this it was assumed that the agents had studied and knew the material and conditions with which they had to work, and that they would use only such parts of the outline as were applicable to the conditions existing in their respective district. Without some definite plan of systematically carrying out their work, the agents' activities must of necessity be more or less of a haphazard nature and to some extent inefficient. Without planning their work in advance, how can they determine what area is to be eradicated next season, what educational material can best be used, when, where, and how it can be most advantageously applied and what service work is required? More thought is needed in planning and carrying out the cooperative field work and it is here that state leaders can be of great help to the agents in personally assisting them to better plan, organize and execute their work.

At the risk of creating a disturbance, I wish to briefly mention the matter of records. Records are valuable for two purposes, first, they show what work has been accomplished and second they are essential for future reference in any follow-up work that may be necessary. Blister rust records should, without fail, include maps showing the location of white pine and areas eradicated and eliminated in control work. For each area eradicated there should be a record of the acreage, the number of Ribes destroyed, the number of Ribes on the check and other data essential for future use. Such information on each area eradicated will be very valuable in determining when and where re-eradication will be necessary, what method of eradication should be used, what Ribes factor was left on the area, how much damage may be expected, etc. Records that answer these questions will save a good

many dollars in the future conduct of control work by eliminating the extra travel and work that would be required to again get this data in the field. Records reflect the orderly manner in which ones work is conducted and the thoroughness with which it is understood. If an agent has good records, his work is likely to be well planned and organized. The keeping of records in blister rust work is no more difficult than keeping records in any other work. They ought not be burdensome, but should be workable and adequate for future use. State leaders should make certain that the records of agents under their supervision meet these requirements.

In closing, I wish to direct your thoughts to the problem of personnel and the lack of available trained men to fill vacancies that occur from time to time. This situation might be corrected, if each state could arrange to finance the employment of one or more men to serve in the capacity of apprentice agents. Then when an agent needed help with some phase of his work the state leader could assign one of these men to work under his direction. When the work was finished the apprentice agent would report back to the state leader for another assignment. In this way the apprentice agents would obtain a broad training in blister rust control work. If in addition they have a good knowledge of forestry to begin with, and the personal qualities that make a good agent, they will constitute a reserve force from which to replenish our personnel.

For our work we need to obtain the best equipped men possible. This is of primary importance. To cope with the blister rust situation, forestry and blister rust training is necessary. Also such personal qualities as leadership, ambition, and energy are essential. Men with these qualifications have potentialities that will enable them to grow. Our work is getting harder

each year. Most pine owners who can be persuaded to eradicate through education alone, have done so, and more and more service work will be needed to gather in those still to be reached. Our personnel should be encouraged in every possible way to improve themselves for their own benefit and that of the work as a whole. They should have the necessary interest in themselves and the work to take the initiative in this matter. It is possible to develop a hard working man who has good basic training and ability, but it is impossible to develop inadequate material. For this reason, it will pay you to seek high types of crew men and foremen, and develop the best of them to the point where they can fill vacancies in the higher positions. This problem needs your careful thought and consideration.

DISCUSSION

Mr. Detwiler requested that the blister rust control agents present tell of some of their 1925 experiences which would help in planning 1926 work.

Barraclough: Believes it is much harder to obtain cooperation now than it was three years ago as best work has been obtained. Necessary to put more effort into work to get desired results.

Holden: Finds it harder to secure the same amount of cooperation. Most of larger owners have already cooperated. Small owners harder to get. Tells of exhibit which he has arranged on his Ford truck - posters, charts, specimens of pine infection and Ribes, etc. Also has exhibit in front of barn - better than window exhibits.

Ross: Holden's Ford exhibit especially attractive at fairs.

Nichols: Work in his district organized after strenuous effort - Forest Committee, chiefly pine owners, formed. Much easier to secure cooperation in 1925 than to do work - weather conditions hindered. School poster contest organized in cooperation with the Farm Bureau. New plan to interview every owner in sections of district being worked - under supervision of Baker.

Baker: List of pine owners first secured. 50% of more than 60 individuals interviewed, promised to cooperate.

Detwiler: Asks Baker average number of interviews per day. Averaged about 4 in conjunction with scout work. Idea of clean-up of town helpful, in getting blister rust cooperation.

Nichols: Record kept of attitude of persons interviewed. This will be helpful in follow-up work.

Dr. York: Fact that he goes on record makes a man more responsive.

Barraclough: Factor every agent has to contend with is using different methods of putting blister rust before the public. Tells of town forestry meeting where blister rust film was shown - had hard work to swing meeting over to forestry subjects other than blister rust.

Cullen: Believes it necessary to get support of important men of town in obtaining town cooperation in control work.

Corliss: Requests that all receive a copy of Dr. Martin's paper as it covers all phases of the work.

Dr. Martin: Papers presented will be incorporated in report of conference.

Amadon: Gets results by indirect contact. Tells of meeting which was organized by outside men where 800 were present. Cites case where he secured removal of cultivated bushes by indirect contact.

Cullen: I have never seen individual change his mind by leaving him alone.

York: Necessary for agent to work brain night and day devising methods of getting cooperation of men holding out. Has asked New York agents to keep a special list of so called "hard nuts" to bring to attention of state leaders. This does not mean that state leaders can crack them but will give them a better idea of the agents' problems.

Corliss: Believes that agents should not only know conditions in his own county but for state. Cites instance in Barraclough's district when owner asked regarding conditions in another town in the northern part of the state that Barraclough did not know about at the time.

Dr. Martin read the following extracts from an annual report of one of the blister rust control agents.

"News Item

News items to the agent mean newspaper publicity and everyone knows that it pays. From the first, this agent made every effort possible to keep the local reporter posted as to what he was doing. Most of the news items appeared in the local columns and it is known that they produced results. During the first two weeks that any work was attempted in this district, the agent was unknown and unheard of. Gradually it became evident that people were reading the papers because more and more frequently they referred to these items. This type of educational method has been most successful in this district and will be continued as the prime means of putting blister rust activities before the public.

Meetings

Field demonstration meetings have not yet been held in this district. Only conjecture might be given as to their value. It would seem that two elements are necessary for the success of such meetings, first the need for such a meeting and second a suitable place for the meeting. Experience in other places has shown that nearly all these meetings have attracted only a handful of people amounting to little if any more than a group. Group or individual demonstrations can usually be easily and quickly arranged and are believed to have greater value than the ordinary or more formal field meeting. Small groups of impromptu origin were found very satisfactory.

In the opinion of this agent, educational work as we now think of it has been overworked in the past. At least education has been overstressed and out of proportion to service work which is of more importance in bringing about the actual control. A proper balance is needed between educational work and service work with the greater emphasis on the service work. Under a policy similar to the one in force in this state, control is a product resulting from one part education and three parts service. In many cases the mixture may be one part education to nine parts service.

Field Methods

With the system of cooperation employed in this state the field methods used appear to be the best available. In this district the state policy is interpreted to mean that each pine owner must be made to "get the habit" of protecting his pine. To this end we will do the best job that we can when we take the owner out with us. Before we take him out we will tell him all we know about the disease; while he is out we will again stress the more important phases and teach him all we can about control. At the end of his course of instruction we will urge him to go back later and check over the work and destroy any strays he may find. Such then is the program in this district as

determined by the state policy. And there is absolutely no question regarding the policy; it is considered excellent. But the policy means that every owner must be taught and the success will depend partly on the teacher and partly on the learner. It will be impossible to change or improve the learners, that is the pine owners, but it may be possible to perfect the teachers and the methods they employ in giving their instructions. If the control work is made interesting to the cooperators they are going to perform that work the better and they should keep at it over a longer period of years.

It is the belief of this agent that the field work, eradication, is not all that it should be. There appear two special ways in which the agent may improve his work. One is to endeavor to make the work more interesting to the owners which will necessitate more study and planning by the agent. He must present his information in a better way and make it more appealing to the owners. The second way is to secure better type of foremen and give them better training in all phases of the control work. He must continue to give them training as long as they remain under his supervision and he must endeavor to make the work interesting to them. These men have the closest contact with the cooperators, especially the persons who do the field work, so that the better the foremen are trained the better the work will be done. A third source of improvement lies outside the agent control and that is a system of state controlled checking. A check which would include not only inspection of eradication work but a study of the teaching methods of the individual agents."

PROGRESS OF BLISTER RUST CONTROL IN THE WEST

by
S. B. Detwiler
Bureau of Plant Industry - U. S. Department of Agriculture

Eradication of cultivated black currants, in cooperation with the State authorities has resulted in destruction since 1922 of 8910 plantings containing 125,959 bushes. This work is completed in the western two-thirds of Montana, and in the entire State of Oregon. In 1926 it is expected to complete this work in Idaho and Washington, where a few counties still remain to be covered. In California, approximately one-third of the State has been cleared of these bushes. Western field data have shown conclusively that the cultivated black currant (Ribes nigrum) is extremely susceptible to rust infection, and becomes infected far from infected pines. Eradication of cultivated black currants has undoubtedly delayed the spread of the rust in the western States.

Two methods of eradicating wild Ribes in local control work are now being developed. The first is eradication by pulling the bushes. In general, the same plan of crew work is followed in the West as in the East, but as experience is gained, modifications are being made to fit the very different conditions existing in the western forests. The second method is that of killing Ribes bushes by applying chemicals to them. This method is expected to be practiced only where dense concentrations of Ribes must be removed. Such concentrations occur on less than one per cent of the area which needs to be cleared of Ribes, but if the chemical method proves practicable, it will effect large savings.

During the past two field seasons, about 13,000 acres of western white pine land in northern Idaho has been eradicated of Ribes. About 600,000 bushes have been pulled at a cost of approximately $3.00 per acre. The per

acre costs varied considerably for the several Ribes types encountered. The chief factors influencing costs are number of Ribes bushes per acre and the accessibility of the area worked. The average cost per acre depends on the proportion of the various Ribes types encountered. It will vary considerably from season to season until the work is done on a scale so extensive that the proportion of the types in the control area closely corresponds with the proportion of types in the region as a whole. The working types, Ribes per acre and costs are as follows:

Type	% in area worked in 1924	% in area worked in 1925	Average No. of Ribes per acre	Average cost per acre
Dense Mature	67	26	2.3	$0.50
Dense Reproduction	4	14	50.	2.22
Open Mature	-	7	92.	2.57
Open Reproduction	26	50	198.	5.64
Stream	3	3	307.	8.11

Control reconnaissance in 1925 covered 180,000 acres, which is a good beginning in this important project. This work is a classification of Ribes types and timber types in such manner as to give basic data on white pine percentages and values, and estimated cost of local control work on the areas covered. These data are necessary in order to intelligently plan blister rust control in the West. We must have it to determine the scale on which the work is to be done.

In the Crater National Forest, in southwestern Oregon, 1874 acres were cleared of Ribes at an average cost of $2.19 per acre. The area averaged 37 Ribes bushes per acre. Merchantable sugar pine and western white pine on the area averaged 18,500 ft. B.M. per acre. Thus the cost of protection

amounted to approximately 12 cents per M. feet of pine. As this was the first wild Ribes eradication work ever done in the sugar pine region, it is certain that many improvements in methods can be made. In general, the same plan of crew work is followed in the West as in the East, but modifications are being made as the men become more familiar with the conditions under which they work.

Scouting shows that the rust is established on pine at Nelson, B.C., 35 miles north of the point where Washington, Idaho and British Columbia meet. Nelson is in the main belt of western white pine extending through eastern British Columbia into the Inland Empire. A highly important discovery was made in the coast region of Oregon. The rust was found on Ribes at three points, one being 80 miles south of the mouth of the Columbia River, and only 170 miles from the great sugar pine forests of southern Oregon and northern California. Present indications point to spread of the rust through the commercial forests of western white pine and the sugar pine in the near future. It was expected that the western white pine area would soon be invaded but it was thought the disease would not travel so rapidly into the sugar pine territory.

DISCUSSION

Newman: Has infection been found on pine in Idaho?

Detwiler: None on Ribes or pine. Will not be long before it will be found further south on account of it being present now in British Columbia.

Corliss: What implements are used in eradication of large Ribes?

Detwiler: So-called New York pick. The bushes are not difficult to pull as they are not firmly rooted. In chemical eradication it is necessary to have chemical which is easy to transport.

Dr. Pennington: In reply to question on moisture conditions Dr. Pennington stated that the average precipitation in Idaho is fully as high as in British Columbia in summer months.

BLISTER RUST IN THE MIDDLE ATLANTIC AND LAKE STATES

by
J. F. Martin
Bureau of Plant Industry - U. S. Department of Agriculture

During the 1925 field season, scouting for the white pine blister rust was carried on in New Jersey from July to September in cooperation with the New Jersey Department of Agriculture under the direction of Mr. H. B. Weiss. Blister rust was found on cultivated black currants in Monmouth, Passaic, Sussex and Warren Counties. In Monmouth County five plantings were found infected near Redbank, Rumson and Shrewsbury. Out of 84 bushes, 49 or 58 per cent were diseased. In Hewitt, Passaic County, two infected bushes were found in a planting of ten black currants. In Sussex County a single bush was found infected near Fredon and in Marksboro, Warren County, 4 out of 12 black currants were infected. In addition to scouting for the blister rust a record was kept of the number of black currant plantings found during the scouting. In Morris County 102 plantings were located, in Monmouth County 19, in Sussex County 10, in Warren County 1, and in Passaic County 1, or a total of 133 plantings in the five counties. In many cases it was found that people who had formerly owned black currants had destroyed them on account of the white pine blister rust.

In Pennsylvania scouting for the blister rust was conducted in cooperation with the Pennsylvania Bureau of Plant Industry under the direction of Dr. W.A. McCubbin. In Wayne County, 2,051 Ribes were examined during July and August. Of these 279 were black currants, 1,496 prickly-gooseberries, 250 cultivated gooseberries and 26 ornamental Ribes. Sixty-two gardens contained black currants. Blister rust was found at

Calicoon on pines and black currants, at Rileyville on black currants, at Damascus on pines and wild gooseberries, and at Laurella on black currants. The infection at Laurella is a new location, the rust having been found at the other places in previous years.

In cooperation with the Michigan Department of Agriculture, scouting for the rust during July, August and September was conducted under the direction of Professor L. R. Taft. A thorough inspection of blister rust host plants was carried on in Oakland and Kent Counties where blister rust had been found in past years, with negative results. Extensive scouting in western Michigan and in the upper Peninsula also gave negative results.

In Wisconsin scouting was conducted in cooperation with the State Department of Agriculture, and under the direction of Dr. S. B. Fracker. New pine infections were found in the old infection centers at Luck, Polk County, at Reserve, in Sawyer County, at Keshena in Shawano County and at Deer Park in St. Croix County. Infection was rather heavy at Deer Park on Ribes triste, glandulosum and hirtellum. A new infection center was found one mile east of Range, in Polk County where 150 diseased pines were located in a stand of about 15 acres of mixed pine and hardwood. In Shawano County the blister rust is not now confined to the Keshena area, since infection was found on R. cynosbati at a point two miles southeast of Shawano and about 9 miles from Keshena. The blister rust was also found in Barron and Dunn Counties. At the Elk Mound infection area in Dunn County, pine infection as well as abundant infection on R. americanum was located.

In Minnesota, scouting was conducted in cooperation with the State Department of Agriculture and the State Department of Conservation under the direction of Dr. E. M. Freeman. Infection on pine was found in nearly all infection areas previously reported diseased, as well as in several new ones. A new center of infection was found for the first time on pines and Ribes at Duluth. Also, pine infections were located for the first time at Two Harbors which is about 20 miles north of Duluth. The rust was found on Ribes as far west as Morrison County. At Duluth R. hudsonianum was found diseased and this is probably the first reported infection found on this species in this country. During the scouting 307 plantings of black currants were found in 14 counties in the white pine district. The majority of the plantings, (242) were found in St. Louis County. Of 181 black currant plantings located in Duluth, 54 were diseased.

Of particular interest were observations made at the following places:

1. At Pine Hollow where all the pine was cut in 1917 in an effort to stamp out the disease in the State; no blister rust was found, although R. cynosbati, hirtellum and americanum were abundant.

2. At Boon Creek, north of Pine Hollow, where Ribes were destroyed in 1917, there were many Ribes as well as good pine reproduction, but no blister rust.

3. At Interstate Park, Taylor's Falls where Ribes have been eradicated only a few bushes were found, mostly R. americanum. No rust was discovered.

4. In the Lawrence Creek area a few miles south of Taylor's Falls one of two adjoining lots was eradicated in 1918. No blister rust was found on the eradicated area, but in the adjoining un-eradicated area many pine

infections were visible on 8 to 10-year old trees.

5. At the Rush Lake infection area which contains large pine, about 75 per cent of the trees are infected. Ribes were removed from the area in past years with apparently good results as no infection has appeared on the reproduction, while in un-eradicated territory surrounding this area, infections were found on young pine and Ribes.

Discussion

Anderson: Asked if infection has been found on pine in New Jersey.

Dr. Martin: Yes, near Red Bank several years ago. None found this year.

Dr. Spaulding: Infection has been found in planting in northern New Jersey.

Filley: Asked if infection in New Jersey is along northern border - Yes.

BLISTER RUST CONDITIONS IN CANADA

by
Dr. A. W. McCallum
Central Experimental Farms, Ottawa, Canada.

Blister rust was first observed in Canada in September, 1914 when infected currants were found in the grounds of the Ontario Agricultural College at Guelph. A hurried survey was at once undertaken which showed that the fungus was widespread upon Ribes in the Niagara Peninsula where small fruits are grown very extensively. The following year an examination of imported white pine stock was made and rust was found in six nurseries and private plantations. Infected native pines were also found near Fonthill in the Niagara Peninsula. The age of the cankers on these trees indicated that they had been infected in 1910 or possibly 1908. At several isolated points outside the Peninsula where imported pines had been planted rust was also found and in 1916 still other similar centres of infection were located. At this time a great deal of eradication of both pines and Ribes was undertaken with the idea that it might be possible to eliminate the rust entirely. This hope, as we know know, was a forlorn one though, indeed, very natural. In 1917 eradication was continued on an extensive scale and in addition to general work of this nature being done wherever rust was found a so-called safety belt, one mile in width, along the Niagara river was cleared of all Ribes both wild and cultivated. The purpose of this Ribes-free zone was presumably to prevent the spread of rust in to New York State but unfortunately it was later found that there was just about as much rust on one side of the river as on the other. Compensation was being paid for all cultivated Ribes taken out so that the total cost of working over this belt of approximately 35 square miles

was quite high. It was not, however, so much the financial aspect as it was the futility of the idea and the degree of animosity aroused among the owners of Ribes which combined to give blister rust a rather severe set-back with those in authority. In addition the eradication around pine plantations was creating a good deal of resentment. I do not know just why it is but it seems to be a fact that your owners here can be induced to part with their Ribes much more readily than ours can. My personal opinion is that it is largely a matter of upbringing and sentiment. A large proportion of our people are either natives of Great Britain or descendants of such removed two or three generations. As you know, the black currant is highly-prized and extensively grown in the Old Country, and so it is not unnatural that these people, when they migrate, should retain their love of the things to which they have been accustomed and that their descendants should be favourably predisposed towards these same things. Of course it is true also that this part at least of this country was originally largely settled by Britons but I presume that by this time the proportion of these people and their descendants is but small in comparison to the total population and further the connection is much more remote than is the case with us.

During the following years blister rust work was confined to the establishment of areas to determine the effects of Ribes eradication, a survey of pine in the Niagara Peninsula to determine the percentage of diseased trees, and general scouting to keep a check on the progress of the rust. In 1921 rust was first found in Nova Scotia and in September of that year in British Columbia. In 1922 it was observed in Prince Edward Island and New Brunswick. In Quebec rust originated from imported nursery

stock just as it did in Ontario and it has been present there for as long a period but since the centres of infection were not nearly as numerous it is very likely that the disease is not so widespread in that province as in Ontario.

Confining our attention to Ontario which is the province about which we have the most information and in which, perhaps, conditions are most nearly alike to those in New York and in the New England States we know that rust on Ribes is widespread throughout the southern part of the province i.e. south of the Ottawa River, the French River, and Lake Nipissing and that it is also present at isolated points north of this. Along the Ottawa River there is a considerable stretch of sandy country in which white pine does exceptionally well and in which valuable young and mature stands of this species occur. In this district rust was first reported on Ribes in 1919 and since 1922 our inspectors have been on the lookout for the disease on pines in the vicinity of infected Ribes but without having located it. However, it appears that their lack of success was not in any way due to the absence of infected pines, since, during the latter part of September, we had the pleasure of a brief field trip through this district with three members of the staff of the office of Blister Rust Control and these gentlemen with their pronounced affinity for anything on white pines faintly resembling a blister rust canker were not long in discovering that the rust was present on both hosts. But even they will admit, I think, that excepting one or two places, infection on pines was light and might easily have been overlooked by anyone but the most experienced field man. The fact remains, though, that our pines are not in any way immune, as successive failures to discover diseased trees had led us to suspect, but, on the contrary,

they are in imminent danger of heavy infection. Such an idea, however, was not without some basis since ecological conditions have a great influence upon fungous diseases. For instance, I am told that in the southern States from Kentucky southward, the barberry rarely becomes infected with wheat rust and is a negligible factor in the life history of the fungus. In the northern States and Canada as you well know this is not the case and it has been necessary to eradicate the barberry as a partial control measure. During the first year in which conditions are favourable for the spread of rust from Ribes to pines we may expect widespread infection and subsequent heavy damage.

These, then, briefly are the conditions in regard to blister rust in Ontario and, knowing that it is present in the manner and extent described and being convinced of the potential danger of this disease, it remains to consider what should be done about it, or rather what can be done because, as you are probably well aware, there is often a wide gulf separating that which we should like to do from that which we are actually able to accomplish. It seems to me that blister rust is not primarily a problem for a plant pathological service to deal with but rather, in the light of present knowledge concerning it, it is essentially a problem in forest protection and as such should be dealt with by the various forest services. This being so, I believe that our first task is to locate areas in which pine is heavily infected - and I think that we have such areas - and there to demonstrate to our foresters the damage which is being caused by rust. I feel that no amount of conversation or writing or even showing them the results which rust has produced in another country would have the same effect as if they could see in their own forests actual

damage from this cause. Secondly the effectiveness of control under forest conditions should be demonstrated and to this end demonstration areas should be eradicated and maintained. In addition, in those districts in which white pine is of commercial importance as much data as possible regarding the occurrence and species of Ribes should be gathered. These, in brief, are the principal lines of work which we hope to take up next year.

In conclusion may I acknowledge the friendly assistance and courteous co-operation which your various organizations have always gladly extended to us. The spirit in which such aid was given, as well as the material assistance itself, has been very gratifying to us and we wish to thank you for it.

DISCUSSION

On account of the late hour, Dr. McCallum's paper was not discussed.

IMPROVEMENT OF SERVICE FEATURES OF CONTROL WORK

by
A. F. Amadon
New York Conservation Commission.

The improvement of the service features of control work can come in two ways, directly and indirectly. The direct method is where, for instance, a state leader goes over with the control agent all phases of the agents daily activities, plans of work for the future, etc., and eliminates the weak points of such activities and plans and emphasizes the strong points. The state leader gives the agent the benefit of his contacts with other agents, touching on the high lights of some other agents successful methods of gaining cooperation. The best direct method is where the control agent goes into conference with himself and picks out his own weaknesses, weighs the relative merits of two procedures to the same accomplishment, chooses the better method and then makes his plans to put it into practice.

The indirect method is the one that is acquired unconsciously by the agent as a result of his own experiences. When the control agents of the Northeastern states started on the work in 1922 practically all of them used the same means of approach, whether to a farmer, banker or school child. They all used about the same set of stock phrases, lead up questions, and answers. Gradually improvements took form in the approaches, mannerisms, questions and answers; in fact, in nearly every effort the agent made. In cases where no improvements took place those agents are no longer with us. Up to this time all sorts of suggestions, plans, criticisms had been loaded upon the agents and they have come through, each in his own district, in his own way, using his own mannerisms, utilizing his own methods. His

improvement has been steady, and he was not conscious of the gradual change taking place. It all may be summed up in the words self improvement or self development. In 1922 an agent used probably ninety percent of the plans and suggestions presented to him. Today he uses probably not more than ten percent of them. Nearly all of the plans that have been suggested for improvement in his work have been tried out. He knows just which ones will fit his particular method of procedure, his particular district and the particular individual he is dealing with. He knows his problem and how to solve it better than any stranger to his district. An Agent in New York State remarked recently that he could utilize motion pictures, newspaper publicity, form and circular letters and literature but to get the remaining cooperation in his district he had to get into his car, get back into the hills and personally interview the land owners. There was no other way to get them to cooperate. Another agent recently told me of a new stunt in furthering the cooperative work in his district, namely, to interview every known pine owner in one town, tell him that the plan was to get that particular town cleaned up and ask him his attitude. Nearly fifty percent of the white pine owners in that town have as a result of this method of approach promised to clean up next year. Nearly all the remaining land owners who are not lined up for cooperation this year probably will be next year when they see what has been accomplished. This is an example of utilizing local pride. This method would have fallen flat if attempted in 1922. These two cases illustrate definite improvements in securing ccoperation. These improvements were worked out by the agents themselves in the field. It is in this way, in my opinion, that whatever improvements are made in securing ribes eradication will be developed in

the last four years of the eight year program. They must be developed by the agent on the job - his own individuality being the force from behind that brings them out.

Checking:- Checking has been one of the phases of control work that has occupied a too unimportant place during the eradication season. Since the start of the work in the east there has been what is known as efficiency checking. Up to two years ago never has it meant to me any more than just so many figures. It is my opinion that the basis of the system was and still is in error, because it deals with number of bushes left and not amount of bush left. Percent of bush efficiency does not tell the whole story. Feet of leaf bearing stem left to the acre, in conjunction with percent or number of bushes left, is a more true indicator:

(1) Of the quality or efficiency of the eradication work done.

(2) Of the future ribes condition on any area where eradication work has been completed.

(3) Of the need for reeradication

Feet of leaf bearing stem left is much more valuable information to have on record than percent of bushes pulled.

The following figures deal with the subject of checking in New York state during the eradication season of 1924 and 1925. In 1924 543 checks were made either by the strip or plot system. In 1925 765 checks were made. Percent of bushes under 6" left in 1924 was 61 and percent of bushes between 6" and 1 ft. was 30, making a percent of all bushes under one foot in height left 91. In other words of all bushes left and picked up by the checking system over 90 percent (actually 91 percent) were bushes with one foot or less of leaf bearing stem. A very large percent of the bushes left

which are from 6" to 1' in height are seedlings and past and present field studies show that only a very small percent of seedlings reach maturity. The mortality of seedlings is high due to being unable to compete with other vegetation. They do not as a rule successfully endure shading. A question which may be raised is how much damage will a certain number of feet of leaf bearing stem to the acre do? At present we lack enough data to correlate a definite amount of leaf bearing stem with a definite amount of damage. But observation on eradicated areas strongly indicate that with the average quality of eradication work being done now in this State a satisfactory protection is being given to the white pine crop. As an example, in 1924 - 15.1 feet of leaf bearing stem was left and in 1925 11.6 feet was left on the average throughout the State to the acre. If only 15 feet of stem are left to the acre and 91 percent are under one foot in height we can feel confident that proper protection, consistent with the cost of eradication is being given. This is a much safer check than one which gives percent bush efficiency without information as to amount of leaf bearing stem or height of the bushes left.

The field practice of making these checks is similar to the strip line work in timber cruising. An eradicated area is gridironed by a strip 6 feet wide and an indefinite number of chains long. A very close intensive search is made for bushes missed by the crews within the strip and the feet of leaf bearing stem and height of any bushes which may be found recorded. This data are put on a per acre basis. In making checks at least one percent of the eradicated ground should be covered in the check. The following figures are from the 1924 report and may be of interest:

The average cost per check for the season was $1.05
" " size of the check for the season was .2 acre
Raised to an acre basis the cost of a one acre check strip or plot was $5.25
The average amount of time used to cover one acre of check strips was 6-1/3 hours.
The cost of checking per acre was $.041.

The importance of the checking is not fully appreciated. It has a decided favorable moral effect on the crew men, land owners and general public and we have found that a guaranteed efficient piece of eradication work has a lot to do with securing additional ribes eradication. A check of this kind keeps the eradication assistant who does the checking, the control agent, and the Albany Office closely informed of the work of the crews. If a checker puts in these strip checks he will not be apt to slight his work for he determines the efficiency of each piece of eradication work in his district. Proper checking eliminates slip shod work. I will not discuss "follow up work" as it is very closely related to the securing of ribes eradication - in fact it is really a part of it. The matter of "records" has been discussed before so much that further discussion is unnecessary other than to say that they are very numerous now although some of them are very essential to the work. All except original field interview records should be worked up after the eradication and intensive interview season. Winter is the best time for the agents office work and not the summer. By March first all records of the previous years work and maps should be out of the way with a clean slate March first for the ensuing year.

DISCUSSION

Littlefield: Asks for information from other states regarding amount of LBS left per acre.

Newman: Basis of checking in New Hampshire is by height classes.

Riley: Data not yet summarized in Connecticut.

Frost: One agent reported about 20' LBS per acre on checks.

Amadon: Does not think that per cent efficiency of bushes pulled correct criterion of work.

Newman: Thinks that basis by height classes better than per cent bushes pulled. Estimate of LBS apt to be inaccurate.

Amadon: Easy to closely estimate LBS after a little experience.

Riley: LBS represents leaf surface which is factor which creates danger - better than height class method.

Frost: Has seen bushes with 50 to 60 five foot canes.

Dr. York: Mentions Dr. Snell's 16 acre study plots which have a total of 35,714 trees; 1 infected tree for every seven feet LBS, and 1 canker for every two feet LBS. We do not know what damage bushes in different situations will do.

Riley: Height of bushes not much of a factor.

Corliss: Asks Dr. York if height of bushes was the predominating factor in his studies in New Hampshire - Yes.

Posey: Finds that almost any fairly good eradication crew leaves a very high percentage of bushes under 6" and usually get 100% of the bushes having over 5' LBS. Very little variation beyond 5' class. Little bushes left are not all seedlings. Some are 20 years old.

Dr. Martin brought up the subject of economy and stated that the Department could supply the States with cut trail paper which could be shipped in 50 pound lots, under frank, free of charge. Requested State Leaders to put in their orders.

P A P E R S

on

E D U C A T I O N A L A C T I V I T I E S

OUR NEW ASSISTANTS IN BLISTER RUST CONTROL

by
L. E. Newman
New Hampshire Forestry Department

Five hundred young Americans in New Hampshire, members of the Boys Clubs, State Extension Service, have expressed an interest in and a desire to carry on some activity calculated to increase the value of the home woodlot or farm.

During the past season about 75 have started projects in forest planting, weeding and thinning. Nearly 40 boys have set out 25,000 pine seedlings, and present indications point to nearly double that number in 1926. Additional projects have been planned for the coming year and include tree identification, collection of commercial woods, seed collection and nursery practice.

All who attended the Eastern States Agricultural Exposition and visited the Theodore Vail Building, must have been impressed with the strides already made in boys club work, and the almost unlimited possibilities which this sort of endeavor hold forth.

On November 7th, the writer spent several hours with a boys club near Claremont. A visit was paid to the plantations of the local water works and the proper methods of forest planting explained. White pine weevil and blister rust were pointed out and the difference between them illustrated by actual specimens. Later in the morning, in a forest of mixed growth, tree identification tests were given. Much to the surprise of the writer practically every tree, both hard and soft woods, were correctly named by all the boys. Great interest was exhibited by these boys, whose ages ranged from 10 to 15 years. Seldom has the writer received greater inspiration from a field trip than that resulting from this outing.

In 1923 one of the Manchester troops, Boy Scouts of America, were taken on a field trip by their leader and Mr. J. M. Corliss, to Pawtuckaway Mountain.

in the town of Deerfield. Before ascending the mountain a few minutes were devoted to tree identification; to blister rust and white pine weevil. Later, while on the summit, forest fire work was explained and the methods employed by the Lookout watchman in spotting and reporting fires.

On their way down the mountain the boys were instructed to watch for blister rust infection and to report each case to either the leader or Mr. Corliss. It is interesting to note that although these youngsters had not seen the rust before that day, they picked up 21 infections in their descent. One boy in particular located a small pine whose terminal shoot had been killed by the weevil; whose trunk contained a blister rust canker, and also some wooly aphis. When these three pests had been carefully explained to him, he stated his intention of carrying the specimen home to his parents.

I have cited but two field trips with boys organizations, although there have been many others, sometimes with junior members of the Y.M.C.A.; the agricultural class of certain high schools and other groups of boys interested in forestry. However, I believe that these two indicate there exists a great field, whose surface has as yet hardly been scratched, for further educational work that will prove of considerable benefit to blister rust control. The boy scout who took his specimen home is not an unusual case, in fact it is likely that the majority will repeat to their parents the things they learned while on these field trips.

Blister Rust Control, like other forestry practices, is something which has more future benefits than present. Therefore, while the education of the boys in the rural communities to the necessity of protecting pines will no doubt bring many immediate results, we will also be building the foundation for future forestry practices.

DISCUSSION

Frost: One field trip with boys very successful.

Perry: No experience of this type except one crew of boy scouts in eradication project.

Anderson: Not much success along this line except in distributing literature.

Holden: Field trip with biology class at high school held during blister rust fruiting season. Letters from prospective cooperators who learned of blister rust through school children.

Merrill: Forestry Department doing work with Boys' and Girls' clubs. 40 boys and leaders planted approximately 10,000 trees. Areas eradicated afterwards and disease explained. One great help in the future of the work will be through boys and girls.

Corliss: Tells of his experience with Boy Scouts - getting in touch with Regional Commander. Much publicity obtained in this way. 2000 Boy Scouts in state- should take advantage of this opening. Good results in New Hampshire.

Riley: Plan to do work with boys in Connecticut. Cites work done by Bradder in Vermont as being a result of his leadership work with Boy Scouts.

Corliss: 2000 acres available for planting in New Hampshire for Boy Scouts.

Amadon: Means of reaching parents. Poster contests worthwhile. Plans underway for slogan contest. Does not believe in young people attempting to do eradication work. Liable to damage private property. Scout leaders in New York request suggestions for ways in which they could cooperate. Should be along educational lines.

York: New York agents and Forestry Department officials plan to address Boy Scouts. Fungi and plant pests doing more damage than fire. Difficult to educate old people - must make start with young generation. Cannot afford to pass-by the Boy Scout organization.

Nichols: Tells of poster contest in his district - organized through Farm Bureau. List of rural schools and teachers obtained. Circular letter sent out to each teacher stating rules, prizes, etc. Agent visits schools and explains contest. Prizes varied from $5 to $20. Cites instance of one difficult cooperator being obtained through a result of this contest. Pupils 8-16 years old eligible. Winner in Clinton County 11 years old. Prize money raised through Grange and private contributions. Prizes awarded for originality, neatness, correctness.

Dr. Martin: Bureau of Plant Industry has been approached by Secretary of Boy Scouts of America. Reads correspondence. Desires this matter be taken up at Conference and see if some program could be worked up for boy scout cooperation. Dangerous to use scouts on Ribes eradication.

Motion made by Dr. Martin that committee of state leaders and Mr. Filler take Boy Scout matter into consideration and make recommendations - carried.

Dr. Martin brought up the question of obtaining a supply of the New York blister rust poster - reading a letter from Mr. Haines. This matter also referred to special committee. The matter of a supply of the posters - "Pine Lot Protected" was also brought up and referred to the special committee.

Dr. Martin announced that 100 sets of Prunus tomentosa would be available next spring and requested anyone who desired some of these sets to put in their order.

LARGE FIELD DEMONSTRATIONS VERSUS SMALL GROUP MEETINGS

by
L. E. Newman
New Hampshire Forestry Department

Ever since the commencement of blister rust control in New Hampshire we have stressed the importance of field meetings. An endeavor has been made to hold as many large meetings as is possible during the Spring, Summer and Fall months. The program, for the most part, comprises identification of the rust, damage and eradication methods. During the past year I have come to the conclusion that more time, effort and expense is spent than the attendance warrants.

The methods employed in advertising such demonstrations are as follows: A circular letter is mailed to some 300 to 400 persons in the town or region where the meeting is to be held. Posters are placed in the stores, post offices, railway stations and at any other points where people are in the habit of congregating. The agent interviews the local project leader in forestry and enlists his aid in giving publicity to the affair. In addition arrow-posters indicating the best route to the demonstration, are placed along the highways. Sometime may also be spent by the blister rust agents in tagging and otherwise marking the infection area. Whenever possible the meeting is advertised in a local newspaper.

What has been the result insofar as the attendance is concerned? Certainly far from encouraging. There have been eight major field meetings arranged since early last May; one of which was held in cooperation with the State of Massachusetts. Probably in the neighborhood of 2,400 circular letters were sent out; several hundred posters, and the combined time spent in arrangements must have amounted to approximately 16 days. The State Foresters of Massachusetts and of New Hampshire, the Fish and Game Commissioner, Com-

missioner of Agriculture and the State Forest Extension Specialist were among the more prominent speakers advertised on the program. In spite of all preparations and inducements the total attendance was about 126 persons. Wherein lies the trouble? Is our advertising material weak or of the wrong character, or is it due to a lack of interest on the part of the public? I shall be interested to learn the opinion of those present and shall be grateful for any suggestions that will prove helpful.

I believe that all possible care and thought has been exercised in selecting the date of such meetings and in all the details incidental to them.

How does the attendance of large demonstrations compare with the small group and individual affairs? During the past nine months disease, damage and eradication demonstrations have been staged, for the most part with but little previous effort. There has been a total of 2,500 persons taken out by the blister rust agents.

It is owing to these facts that I have come to lose faith in the large group demonstrations and am of the opinion that considering time and expense greater results may be secured from individual or very small group meetings. From the standpoint of those we are endeavoring to interest in our work there is no doubt but what they derive more information and have a better opportunity to ask questions than is the case where one attends a large meeting. I shall be very much interested in hearing a discussion on this subject before our conference adjourns.

DISCUSSION

Frost: Little stress on this phase of the work in Maine. Only one agent has done any of this work. Believes better results obtained by individual instruction. 1505 cooperators taken out and shown disease and control methods this past season. Hard to get people out to field meetings.

Newman: Mentions meeting at South Deerfield in 1921--1500 circular letters sent out, aid of Farm Bureau, several county papers, and several hundred posters. Attendance over 100.

Perry: Has same opinion of field demonstrations as Frost.

Anderson: No such meetings held in R.I.

Ross: Very few such meetings held in Vermont. Tells of school classes being taken out by agents. Extension forester brings up blister rust at his meetings. Believes blister rust organization should get closer cooperation from Forestry Departments. Many calls in Vermont lately for members of Forestry Department to give talks - approximately 10,000 people reached in this way. Strongly believes that State Foresters should get behind Blister Rust and shove work along.

Dr. York: Only pathetic thing about Mr. Ross's remarks was that more State Foresters were not present. Thinks Ross absolutely right. Appears as if State Foresters looked upon blister rust as a mere incident.

Mr. Detwiler: Very grateful for what Mr. Ross said. Is devoting his time to getting foresters interested in blister rust so as to show what must be done in practice of forestry. Forest protection must be included in practice of Forestry. Must get foresters sufficiently acquainted with blister rust problem so they will include it in their management plans. Cannot expect to get satisfactory white pine re-growth without eradication of Ribes. Our organization has attained a certain amount of success but blister rust must be put before the public more.

Riley: Agrees with Newman that field demonstration meetings are too costly for what you get out of them. Better contact by individual instruction.

Amadon: Have had a few meetings on a large scale in N. Y. - Many who attended these meetings represent the work. Tells of field trip with 26 members of the Board of Supervisors in Warren County. Very hard to give individual attention to large groups.

Stevens: Locality and situation have bearing on attendance.

Riley: More educational work at large meetings but more intimate contact with individual instruction.

Frost: Better cooperation with Extension Foresters would help.

York: State Forester in N. Y. has been great help in making blister rust demonstrations a success. Feels that it is very vital that we have State Foresters closely allied with our organization. Questions methods of organizing meetings - outside assistance helpful. Harder to handle large groups in field. Individual attention very essential.

A SURVEY OF THE COMPARATIVE PRODUCTION, VALUE AND USE OF WHITE PINE AND OTHER WOODS IN VERMONT

by
Perry H. Merrill
Vermont Forest Service.

Due to weather conditions and the scattered pine areas in Vermont, regular Educational and Service Work is reduced to a low point of efficiency during the winter months. The three Blister Rust Agents located in the Connecticut Valley districts spent part of their time during the winter of 1924-25, on this survey. The survey has been completed for Essex and Caledonia Counties, and the data summarized. The field work in Orange, Windham, and Windsor, will soon be completed.

Value of the Survey

This survey has brought each Agent in contact with a new class of people, those who use White Pine. The education of the mill owner who uses White Pine will help materially in obtaining eradication of pine areas belonging to recalcitrant pine owners. Many times a word of advice from the pine user will be more receptive by the pine owner than from the Blister Rust Agent. The summary of this data will form a basis for further educational work in the form of charts, articles, and news items. The survey will be a decided benefit to the Agent by opening up new fields for more intensive methods of educational work. This survey should be a decided aid in securing cooperation in that the Agent may show the comparative value of protected versus non protected pine. The figures obtained from the survey show the value of White Pine to the community. The Agent may bring out its economic effects. If the White Pine were killed by the White Pine Blister Rust; the town would lose that much in taxable value which would have to be obtained

somewhere. Thus each individual of the community has a direct interest in White Pine Blister Rust eradication, because the loss of his neighbors pine means an increase in his own taxes.

The banks which hold mortgages on lands containing White Pine can be interested by showing them the decrease in value of the property by the loss of the White Pine.

The survey has given each of the Agents a broader idea of the Value of White Pine. Many a time they may be able to obtain the eradication of a White Pine area by informing the owner where he may dispose of his pine. Such service materially aids the Blister Rust program.

Educational Value of Survey

Twenty-eight owners reported that they were doing nothing to increase or protect White Pine growth. Six of the pine owners were induced by the Agent to have their pine protected by the eradication of the currant or gooseberry bushes.

Of all the owners interviewed only nine showed no interest in Forestry. The others were interested in ribes eradication, careful cutting of White Pine so as to insure future crops, planting White Pine and general conservation.

From fifty-eight owners it was gleaned that ten had no knowledge of White Pine Blister Rust; thirty-two had a partial knowledge, and sixteen seemed to have a very definite knowledge.

Of seventy-five owners of wood using industries only two refused to cooperate. The others agreed to cooperate; sixty-six by lending their moral support, and seven by the eradication of Ribes.

VALUE OF DATA ON THE USE OF WHITE PINE AND OTHER WOODS IN BLISTER RUST CONTROL.

by
O. C. Anderson
Rhode Island State Board of Agriculture

"The production and value part of the survey undertaken in 1925 is completed and summarized. The summaries show 54% of the lumber produced in Rhode Island is white pine. This is more than the oak, chestnut, maple and hard pine combined. The revenue from white pine lumber was 51% of the total return. Chestnut production is second in board feet production but third in point of revenue returned. Oaks place third in board feet production but second in point of revenue returned. The use and production of chestnut is rapidly falling off. The New Haven railroad does not place new contracts for chestnut ties because of excessive sap rot. The production figures for chestnut for 1925 show that the production of chestnut has fallen off 50% in the past year.

The utilization data has not been completed and many difficulties have been encountered. It has developed that the drop in price of white pine box-boards from $32 to $25 per M is probably due to the adoption of veneer shipping containers by all textile mills. These light veneer shooks are made of Maine birch, beech and maple and use only 2" strips of softwood on the edges - sometimes of southern pine. What the future developments of the white pine box-board markets will be is uncertain.

To sum up the value derived directly from this survey; I have made over 150 new contacts with persons interested in blister rust control not obtainable in any other way. Above all the benefits derived, we have a clearer understanding of the problem of marketing white pine and other woods in the state and can talk more intelligently to woodlot owners instead of guessing."

DISCUSSION

Merrill: Increase in volume of service work this year shown by the fact that during 1924 the blister rust control agents made a total of 648 initial interviews and this year during the period January-September, 764 initial interviews were reported. The agents also obtained a list of all pine owners. Feels that this survey has been beneficial to Vermont.

Mr. S. B. Detwiler requested Mr. Russell T. Edwards, publicity director for the American Tree Association to give a brief talk on educational publicity.

Mr. Edwards stated that the arrangement of material in news article is very important. Start off with something of general interest which will compel one to read the article. Insert the main facts later in the article. Unusual heading frequently effective- such as: "No More Gooseberry Pie". Quote what important local men have done or said about blister rust work, getting permission to use their names. Suggests that four or five local persons be requested to write to editor thanking him for the space given to White Pine Blister Rust. This makes big impression on any editor and is phase of local publicity that is widely over-looked.

P A P E R S

on

E X P E R I M E N T A L A C T I V I T I E S

SPREAD OF THE WHITE PINE BLISTER RUST IN THE EASTERN STATES

by
L. H. Pennington
School of Forestry, Syracuse University

With respect to all white pine regions in which the blister rust is not already known to be present two important questions are asked. How long before the rust will appear? How much damage will it do when it becomes established? Upon the answers to these questions will be based to a great extent the policy of protection which will be practiced in each region. Unless the blister rust is taken into consideration and provision made for its control white pine is certain to be a failure in many places where it should be one of the most value valuable timber trees.

Since both these questions require numerical or quantitative answers, the problem before us may be considered from the standpoint of mathematics. We may therefore let X represent the number of years before the rust will appear, and Y represent the amount of damage which will result. These are the unknown quantities whose values must be determined before any far-reaching plan of white pine management can be formulated with safety. Although it may not be possible as yet to determine these values exactly for all pine regions, it is possible to arrive at approximate values for many important white pine districts.

To solve for these unknown quantities X and Y, it is necessary to have certain quantitative data. These data may be considered under two groups as follows:

1. Data for regions in which the rust is established.

2. Data for white pine region in question, where the rust is not known to be present, and for the country lying between the regions of infected pine and those without infection.

Under group 1 the following factors should be determined:

a How long has the rust been present
b How much infected material was originally introduced
c How much damage has been done
d How far has the rust spread, both by gradual advances and by long distance jumps

For both groups the following factors should be determined:

e What are the numerical and space relations of the pines and ribes? (In other words, how many pines and ribes are present and how far are the alternate hosts from each other?)
f What are the climatic conditions, amount and distribution of moisture, and amount and direction of wind during the growing season?
g Topography of the country
h Extent to which any of the factors enumerated have been modified by control measures.
i The factor of chance.

It is now time to classify and coordinate the data already collected and to secure additional data regarding the factors which are not sufficiently well known.

These will be briefly considered in the order in which the factors have been enumerated above.

a How long has the rust been present? From importation records, planting records, and field studies of infected trees, it has been possible to determine fairly definitely the time of introduction of infected plants. It has also been possible to determine fairly accurately the time of successive waves of infection in this country.

The earliest introduction may have been upon cultivated black currants in 1896. Several introductions of infected pines were made in 1901-02. A few more were made between 1902 and 1908. In 1909 a large number of infected trees were introduced and distributed widely. Since 1912 there have been no introductions of diseased pines from abroad.

In the meantime the rust has spread widely in some localities and apparently nearly disappeared in others. The frequency with which heavy infection is found in places where it was not known before leads to the conclusion that there is infection in many other places not yet discovered.

b The amount of the infected material originally introduced cannot be determined with any degree of accuracy. In many instances presence of the rust was not discovered for several years. In the meantime many of the infected trees had died or were destroyed. The amount of material, however, does not seem to have been so important as the conditions, particularly with respect to the presence of pines and ribes. A single infected tree or bush may be the source of heavy infection in one locality, while many infected trees in another locality might cause no further infection in that locality. The chances for wide-spread infection are increased with the constantly increased production of aeciospores.

c The amount of damage already done has been measured in some localities. Trees of all ages may become infected and trees of saw-log size may be killed. The loss may range from a negligible amount up to 100 per cent, depending upon the ribes present. The greatest damage results from the rapid killing of young trees. Seedlings are frequently killed in such numbers that pine reproduction becomes impossible. When this fact is considered in connection with a realization of the potential value of white pine, some idea of the damage is obtained.

d How far has the rust spread? It is now known that the rust may spread not only by gradual stages but that it may be spread broadcast over large areas at once and that wind borne aeciospores may cause infection 200 or more miles from their source. The rust is widely spread over New England and

Eastern New York. It is not possible to say how far it has spread naturally since infected pines from Europe were widely distributed throughout these states. It is apparent, however, that a spread of 20-30 miles in a season has frequently occurred. In the Lake states the rust has spread eastwards over halfway across Wisconsin and in Minnesota northward beyond Duluth. It is not unlikely that there has been a spread of 50-60 miles in a single season in these states.

e Relation of pine and ribes. This is a complex factor and the large amount of data already collected needs to be correlated and supplemented. some ecological studies of ribes have been made. Differences in susceptibility and infecting power of different species are known. Aeciospores are comparatively resistant and may cause infection upon ribes several weeks after they are shed and at long distances from their source. Sporidia on the other hand are very short-lived and consequently usually do not cause infection more than a few hundred feet from their source. Experiments and field observations show that under favorable conditions they may retain their vitality for 10-12 hours and cause serious infection a mile or more from their source. Certain very susceptible species as R. nigrum are the most important agents in long distance spread, since they may become heavily infected through a single spore inoculation. Other species do not become heavily infected except as they are inoculated with many spores. When the rust becomes well established in a locality these more or less resistant species may be a greater source of danger to pine than the more susceptible kinds which become defoliated by heavy initial inoculation.

f Climatic conditions during the summer months determine to a very large extent the amount of infection which will occur in any locality

where the rust and both hosts are present. Although we still lack detailed data upon the exact conditions under which infection of pine occurs, it is known that precipitation and high humidity for periods of 18 or more hours favor infection. In any locality in which white pine will grow infection will occur every year upon ribes and usually a little will occur upon small pines in close proximity to infected ribes. Field observations have shown that severe infection has occurred on an average every four years in the places where the rust is established. In general these years of heavy infection are the years in which there was more than the usual precipitation during the summer months. Study of meteorological data shows that there are longer cycles in which greater extremes of drought or precipitation occurs once in 10-12 years and that every 30-35 years there are still greater extremes to be expected. There is already some evidence that infection of pine is unusually severe every 10-12 years, and there is good reason to believe that once in every 30-35 years there will be more severe and general infection that we have yet seen in this country.

West winds favor a greater spread of the rust toward the east. There are however, winds from other directions during the season of spore production so that if other conditions are favorable, the rust will advance in any direction.

h Control measures have been shown to be effective in localities where they have been practiced. Eradication of ribes in the vicinity of pines has prevented any further infection. Destruction of infected pines has reduced the number of aeciospores and thereby diminished the chances for long distance spread of infection upon ribes. Eradication of R. nigrum in localities where pines were not infected has lessened the chance for infection. The rapidity with which the

disease will advance into new territory will depend both upon the rapidity with which control measures are effected where the rust is present and protective eradication is accomplished in localities where the rust is not yet present.

i. The factor of chance is at present an important one since so little is known about many of the white pine districts. So-called "chance infections" occur frequently and the available data seem to show that the chances for the beginning of new centres of infection are much greater than the chances for the dying out or disappearance of the rust in any place where it is once established.

A preliminary survey of the field and an examination of the data collected indicates that the rust is advancing into new territory, and that it will eventually come into all the white pine regions of the east. It is altogether probable that in less than the life-time of a white pine from seedling to saw-timber size, the rust will be in all white pine regions.

The damage because of the injury and death of older trees, in itself a large item, will be only a small part of the total loss. This loss can be determined only when the value of a mature stand is estimated, and it is realized that this mature stand can never appear because the natural reproduction which would have produced it is killed in infancy by the rust.

If white pine is to be considered in any forward looking forestry program, protection against blister rust must be taken into consideration and adequate provision made for its control.

DISCUSSION

Ayers: Very grateful to Dr. Pennington for his paper. Cites situation at his camp in N. H. where he found one tree infected with blister rust. Woods full of wild Ribes one-eighth mile away. Wonders why only one tree should be come infected.

Pennington: Chance infection rather than due to temperature.

Dr. Clinton: Asks Dr. Pennington how he arrived at 35 year cycle.

Dr. Pennington: Cites cases of other fungi - has no figures on blister rust as it has not been here long enough.

Kennedy: Asks if 1925 was favorable year for infection.

Pennington: Believes both 1924 and 1925 were heavy infection years except in Lake States.

Kennedy: Asks how far chestnut blight will spread.

Spaulding: Tells of instance at Middlebury, Vt. where several trees about 25 miles from any other chestnut were badly infected.

Newman: Early investigations in Pennsylvania showed that disease jumped 25 miles.

Dr. Martin: What were conditions in Pennsylvania and Minnesota.

Dr. Pennington: In Minnesota found rust most everywhere when Ribes cynosbati were present. Many black currants in Duluth region means presence of rust sooner or later. Found 27 plantings of black currants in two hours at Ironwood, Mich.

Abundance of wild Ribes in Wisconsin. More intensive eradication in this state - many infected trees cut out.

Doubts if eradication of infected pine does any good. Should put little stress on natural barriers. Education of public most important. In Pennsylvania found an abundance of Ribes in places visited.

A STUDY OF RIBES ERADICATION IN CONTROL OF BLISTER RUST CONNECTICUT AGRICULTURAL EXPERIMENT STATION AND BUREAU OF PLANT INDUSTRY COOPERATING

by
W. J. Endersbee

Bureau of Plant Industry - U. S. Department of Agriculture

During the early summer of 1925 a recheck of eradication work done on areas worked in Connecticut in 1920 and 1921 was carried on jointly by the Connecticut Agricultural Experiment Station and the Bureau of Plant Industry. The purpose of the recheck was to determine the thoroughness of Ribes eradication the need for future eradication and the effectiveness of control measures.

The areas checked comprise 1691 acres worked in the town of Colebrook in 1920 and 806 acres worked in Colebrook and North Canaan in 1921. The 1920 area lies in one contiguous block in the northwest corner of Colebrook along the Massachusetts line. The 1921 area in Colebrook extends south from the 1920 work and is cut into smaller parcels because of smaller and more scattered groups of pine. The North Canaan area is a solid block lying east of Canaan village. All the checking was confined to eradication work which was done by crews consisting of five men and a foreman. One block in Colebrook was first worked by a scout and afterwards by the crew as a check on scouting.

CONDITIONS FOUND ON AREA AT TIME OF ORIGINAL ERADICATION.

The record of the original eradication on the areas checked shows in Table I that 22.94 Ribes per acre were found. In Colebrook the 1920 work yielded 25.02 bushes while the 1921 work yielded only 5.03 per acre. This difference is thought to be due to the eradication of solid block areas in 1920 where more non-pine types having less mature forest growth were covered. A little later it will be shown that the non-pine types produce more Ribes per acre than the pure pine types. The 1921 work in Colebrook being more confined to pine areas and smaller protection zones yielded fewer Ribes.

TABLE I. Eradication Summary.

	Colebrook			North Canaan	Totals
	1920	1921	Total	1921	1920 1921
No. acres eradicated	1691	513	2204	293	2497
No. Ribes found	42,313	2580	44,893	12,394	57,287
No. Ribes found Per A.	25.02	5.03	20.37	42.3	22.94

FIELD METHODS.

Strip lines 16-1/2 feet in width were run by compass in each block until one per cent of the area had been checked. On these lines the data were recorded

by transects of 66 feet. The lines were run across topography and were spaced to secure a 1% check with the most equal representation of types. So far as possible, however, pine types were favored for checking. Stakes were set at the beginning and end of each line so that further examination may be made of these same areas if desired in the future. The size of the crew varied from three to six men but was maintained at five during most of the time. This size crew is well adapted where Ribes or pine or both are abundant because then there is no lack of work for all members. When Ribes and pine are sparse a three-man crew is equally effective and far more economical than the larger crew.

CREW EFFICIENCY IN FINDING RIBES.

At the time the initial eradication work was done there was an average of 26.66 bushes per acre on the areas, as indicated in Table II. The crews found 22.94 of these or 86% and missed 3.72 or 14%. In Colebrook in 1920 they found 87% when solid blocks were worked as against 69% in 1921 when only the pine areas were selected for work. It happens however that the number of bushes left on the 1921 areas is less per acre than on the 1920 areas so that the actual protection is superior to the 1920 work.

TABLE II. Crew Efficiency in Finding Ribes.

	Colebrook			North Canaan	Grand totals
	1920	1921	Totals	1921	
No. Ribes per acre present at time of initial eradication	28.31	7.3	23.77	47.7	26.66
No. Ribes found by crew.	25.02	5.03	20.37	42.3	22.94
Per cent of Ribes found by crew.	86.9	69.0	85.7	88.7	86.0

CREW EFFICIENCY IN ERADICATING RIBES.

The crews did not destroy all the bushes they found. The recheck shows that from 6% to 30% on different areas and in different years were poorly or incompletely eradicated. On an average the crews destroyed 89% of the bushes they found, while 11%, representing sprouts and partly pulled bushes, were left in the ground. Calling this poor work and charging it against the crews, it appears that whereas they found 86% of the bushes they actually completely destroyed only 76.45%. The incompletely eradicated Ribes just referred to have been classified as follows, crown sprouts making up 47%, root sprouts 35% and partly pulled bushes 18%. All sprouts constitute 82% of this class.

TABLE III. Crew Efficiency in Eradicating Ribes.

	Colebrook 1920	Colebrook 1921	Colebrook Total	North Canaan 1921	Grand Totals
No. Ribes per A. originally present	28.81	7.3	23.77	47.7	26.66
No. Ribes per A. found by crew.	25.02	5.03	20.37	42.3	22.94
No. Ribes per A. completely eradicated.	22.16	3.52	17.86	39.6	20.38
Per cent Ribes found completely eradicated.	88.5%	70.0%	87.6%	93.6%	88.8%
Per cent Ribes originally present completely eradicated.	77.0%	48.%	75.0%	83%	76.4%

RIBES FOUND IN CHECKING.

The Ribes found in checking the areas were recorded in four classes: missed bushes representing 27% of the total, partly pulled bushes 3%, sprouts 15% and seedlings 55%.* Sprouts have been further classified into crown 9% and root 6%. Seedlings which are those bushes which have come up since the eradication work was performed make up more than half the number of Ribes now on the areas. In Colebrook there are three times as many seedlings per acre on the 1920 area as on the 1921 area which in itself raises the question if one more year will produce seedlings on the 1921 area in proportion to those now on the 1920 area.

RE-STOCKING OF RIBES FROM SEED.

The extent to which the eradicated areas are becoming restocked from seed is interesting. The average for all work shows that 28.5% of the original bushes have been replaced by seedlings in four and a half years or at the rate of 6.4% per year. At this rate it will take 16 years for the areas to become restocked to the original capacity. On the North Canaan area where the Ribes

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* Footnote: A missed bush is one which was present at the time the eradication was done and was not found by the crew. A partly pulled bush is one which the crew attempted to destroy but took only part of the stalks and left the rest of them.

A sprout is a bush that has grown from a root or crown left in the ground, hence a root or a crown sprout.

A seedling is a bush which has sprung up from seed since the eradication was done.

were more abundant the time required for complete restocking is cut to 10 years. Greater original stocking does not, however, appear to be the prime influence in restocking from seed to original capacity since the Colebrook area worked in 1921 had the fewest Ribes per acre and will require only 12 years to reseed which is only two more years than is needed in North Canaan. The figures indicate, however, that areas with largest number of Ribes will be the first to restock to a point which is destructive to pine. The actual return to original Ribes capacity may be much sooner than is indicated above because of the missed bushes, sprouts etc. The average stocking now present on the areas is 52.4% of what it was originally, and indicates that areas should be reworked in about eight years where the quality of eradication and Ribes growth conditions are similar to those on the areas studied.

REASONS FOR MISSING RIBES.

The reasons for missing Ribes are not easy to determine after five years. Seedlings stand out as a valid reason and these bushes can be determined fairly accurately by counting the growth rings or years growth on the woody stems or branches. Bushes which were young seedlings at the time the areas were eradicated make up 23% of the total missed. Five per cent were attributed to other unclassified reasons, such as screening and out-of-the-way places, such as trees, and the remaining 72% were missed for no reason at all.

RIBES FOUND BY TYPES.

All types except pure pine show an appreciably large number of Ribes per acre. Hardwoods, brush, slash and pine-hardwoods have very slight differences in the number per acre and are all near the average of 13.9 per acre. The pine-brush type produces the greatest numbers with swamps second in abundance. Pure pine stands produced the lowest of all types, having less than one bush to the acre. Contrary to general opinion, open land is low on the scale with only 4 bushes to the acre.

RIBES SPECIES BY TYPES.

The Ribes species encountered on the areas were principally gooseberries which formed 92%; skunk currants make up nearly 6%, red currants about 2% and one black currant was found. Gooseberries were scattered through all types, being found in greatest abundance in the pine-brush types. Swamps come second in numbers, while hardwoods, pine-hardwoods, brush and slash all appear to be about average. Skunk currants seem to favor the hardwood and hemlock types but since much of these types are made up of low land, a finer distinction in type classification might produce a larger acreage in swamps with a consequent greater abundance of Ribes for the swamps.

KINDS OF RIBES BY TYPES.

Three classes of Ribes, namely seedlings forming 55%, missed bushes 27% and sprouts 18% constitute the bushes found on the check. Seedlings are most numerous in the pine-brush and swamp types with the pine-hardwood type coming third and much above the average of 7.61 seedlings per acre. The other types except pure pine and open land have about the average number. Pure pine has almost no seedlings and open land has a very small number, contrary to what might be expected in the open. Sprout growth appeared in each type in about the same proportions as seedlings. Bushes were missed in all types in about the same proportions, except in the pine-brush type where the number per acre missed is 16, far above the average of 3.6.

NUMBER OF FEET OF STEM BY TYPES.

As disclosed by the check there was an average of 40.6 feet of live stem per acre and 2.94 feet for each bush. The slash type contained 111.2 feet and the pi e-brush type was second with 75.4 feet. Except pure pine with only 4.6 feet, the other types are very close to average. The size of the bush, that is the number of feet of live stem bush, varies almost directly with the amount of light available. Open and slash types show a pronounced increase over the more dense types of hardwood and brush. Dead stem shows greatest in swamps, hardwoods and pine-brush types in the order named. All other types are considerably below the average 7.7 feet per acre with pure pine having only 0.12 feet.

PINE INFECTION.

Data on pine infection are meager due principally to the small amount of young pine on the Colebrook areas. From available figures however, the production of pine infection appears to have been decreased after the bushes were destroyed. In Colebrook before eradication, there were 3.8 cankers developed for each Ribes bush per A. while after eradication only 1.9 develope On the basis of the number of cankers per acre there were 3.48 developed in Colebrook before eradication with only 0.35 after eradication, which is a decrease in production of 75%. On this same basis production of cankers per acre has decreased an average of 63% on all the areas checked with the largest decrease of 90% occurring on the 1921 Colebrook area where Ribes were originally the least abundant. On the other hand, the lowest decrease of 35% is on the North Canaan area where Ribes were most numerous originally and where more Ribes were left after eradication.

The study in Connecticut reveals that a crew of five men and a foreman found an average of 86% of the Ribes and of the remaining Ribes not found, nearly three fourths were missed outright for no reason at all, while one fourth were missed for valid reasons, the principal one being the fact that the bushes were small seedlings at the time the work was done. The data further show that 11% of the bushes found by the crews were incompletely eradicated. In some cases only a part of the bush had been destroyed or that roots and crowns were left in the ground and sprouted. Work of this type if charged to the crews lowers their efficiency in destroying bushes to 76.5%.

If crew efficiency of 76% or even 86% seems small in comparison to the 96% we hear so much about, it has produced results. The real test of control efficiency is not in the number of bushes destroyed by the crews but rather in the number of Ribes left on the areas. If the number of Ribes can be reduced low enough and kept low enough the result will be effective control of the disease. As indicated by decrease in rate of pine infection on the areas checked in Connecticut control appears to have been increased 63% by eradicating, which figure is slightly lower but about in proportion to the degree of crew efficiency of 76%. It also corresponds very closely to the reduction in the number of Ribes on the areas.

DISCUSSION

Mr. Littlefield asked if any data had been obtained on the relative seeding of different species. Mr. Endersbee informed him that the data had not been worked up as yet.

DESCRIPTION OF EXPERIMENT WORK UNDERWAY AT NORTH HUDSON, N. Y.

by

A. E. Fivaz.

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During the past summer we have been basicly engaged in gathering field data of Ribes, of control work, and of pine infection, at North Hudson, N.Y., on the Experimental Control Area. Although much data have been accumulated along various phases of the experiment underway on the area since its establishment in 1921, summarization has been necessarily held up pending the taking of re-examination data after a lapse of time sufficient to permit the making of comparisons and the drawing of conclusions as to the natural reaction of pine and Ribes to control work. The 1925 data are expected to produce some results for publication this winter, but as the field season has just closed, no summary work has been carried to completion. Therefore I have no results to offer to you, but will touch briefly upon the lines under investigation on this area.

The Experimental Control Area is a tract of land set aside by the New York Conservation Commission for the carrying on of cooperative experiments in control work. It is located in the Schroon River valley in the town of North Hudson, Essex County, N.Y., and comprises some 1771 acres. The elevation of the tract varies from about 950 to 1606 feet above sea level. The bulk of the area is under forest cover, but only partly of pine type. White pine occurs in rather definite groups aggregating about one-third of the total acreage, birch, aspen, other hardwoods predominating over the rest of the area.

The tract is near the optimum center of the range of Ribes rotundifol other species in order of distribution are: Ribes glandulosum, R. cynosbati, R. triste, and R. vulgare.

All land in pine needing protection was examined for Ribes, chiefly by the crew method. In 1921, the first year, 145 acres were eradicated by crew, in 1922, 290 acres, and 1923, 135 acres. Added to this total of 570 acres eradicated by crew, are about 100 acres covered by scout or by one or two man method, giving a total area eradicated of 670 acres.

In every case, eradications were followed by a data crew, by whom each bush pulled was examined and the following data was recorded: Height, live stem and percent of leaves infected.

Previous to eradication, study plots varying in size from .9 to 1.2 acres were laid out in the blocks to be eradicated. Seven plots totaling 7.8 acres were laid out and studied in 1921, seven more plots totaling 7.8 acres in 1922, and one of 1.2 acres in 1923. Two plots, total area one acre, were studied in 1921 but not eradicated, being located in an area reserved for the study of the rust under undisturbed conditions. Pines on all these plots have been examined for infection, and each tree tagged and plotted on a map to permit connecting up of future data. Detailed Ribes data were likewise secured before eradication, and the bushes numbered and plotted on large scale maps. This past summer, all survivors were staked, each stake bearing numbered aluminum tags designating a particular bush, for positive identification of individuals in the future.

Studies falling into four classes are underway at North Hudson:

1. Eradication of Ribes.
   - (a) Study of factors determining time (cost) per acre.
   - (b) Efficiency of eradication.
   - (c) Decrease of cost of eradication through use of picked men and methods (comparative crew eradication experiment and detailed analysis of one year's eradication work are completed).

2. Ribes ecology and susceptibility.

(a) General relation of number per acre, and size (height and live stem) to natural factors such as type.

(b) Ribes infection and susceptibility.

(c) Ribes growth and comeback after eradication.

(d) Natural growth and replacement of Ribes under blister rust conditions where no eradication has been done.

3. Effectiveness of eradication.

(a) Effectiveness of eradication and amount of Ribes safe to leave.

(b) Minimum width of protective strip and factors influencing same.

(c) Comparison with uneradicated area for infection since eradication.

4. Damage by blister rust.

Many possibilities for studies, the basis having been established when original pine data was taken and tree tagged. Some are:-

(a) Relation of number and size of Ribes to amount of infection resulting.

(b) Rate of killing of pine by blister rust.

(c) Rate of canker growth, percent of recovery, etc. etc.

I will not go into the details of these experiments. The list includes possibilities as well as studies actually being made, and some may not materialize while others may be added. Suffice to say that there is still a great deal of work to be done on the studies undertaken, the tendency will be to reduce rather than add to this list.

Relative to the study of Ribes growth and comeback after eradication, we have fairly reliable original (before eradication) measurements on over 5000bushes, over 1000 of which are still under observation. Many of the original measurements were made in 1921, the rest in 1922 and 1923. In 1923 after completion of all eradication, all the survivors found were again measured, and this year the same process was repeated. The data for the three examinations have been transferred to tabulating machine cards by use of which we hope to shorten materially the task of summary and analysis during the winter at Washington.

It is hoped that this data will throw some light on the problem of "when and where do we re-eradicate", but they cannot be expected to answer the question for all types, all conditions and all states. The number of plots on which the results will be based, is limited and the plots all located in pine types, which, although of first importance, are not the only ones to be considered in eradication.

DISCUSSION

Spaulding: I would like to ask what basis is being used to figure damage?

Fivaz: No damage studies have as yet been carried beyond the point of securing basic information on infection and of tagging the trees for future work. No basis for damage computations has been developed.

A PRELIMINARY REPORT ON A STUDY TO DETERMINE THE SIZE CREW BEST ADAPTED TO ERADICATION WORK.

by
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Connecticut Agricultural Experiment Station

We have all been pretty well agreed upon the most effective size crew for eradication work. Experience has eliminated the large crew because of the difficulty of directing and checking by the foreman. The two and three man crews have been likewise discarded as too expensive, because it was thought that the foreman's time bears too high a ratio to that of the lower paid men. It is now generally assumed that the five and six man crew, directed by a foreman, is the most easily managed and efficient crew under ordinary field conditions here in the northeast. There are, however, as far as the writer knows, no figures available to substantiate this assumption. We believe it, but we have not proved it. The purpose of this experiment, therefore, is to determine by means of field data gathered under normal working conditions what is the most effective crew and why.

The objectives are three-fold:- First, to study and correlate the more important factors making up crew efficiency: second, to determine the most efficient size crew and, third, to determine the comparative costs for equal work done by crews of different sizes.

I will not attempt to give in detail the steps by which the few results already reached were obtained. It would take too long and would be difficult to follow without the statistical tables for reference. Therefore, since this is a preliminary report, a brief description of the methods and procedure followed in the experiment with a bare statement of facts as indicated in the preliminary study must suffice.

The field organization consisted of five units namely, crew men, foreman, data men, tally man and observer. A group of men, all of whom had had approximately the same training and experience, worked abreast in line formation systematically covering the ground in consecutive strips across the area. A foreman followed the line, directing and checking the work of the men. Following the crew were four data men whose duty was to examine each bush pulled to determine the species, height class within which it came and the number of feet of live stem. A tally man recorded this data and an observer, who supervised the experiment, recorded the time of starting and finishing each plot, noted the time lost and the reason for lost time. He made notes on topography, ground cover and any other factors that appeared likely to materially effect the cost and efficiency of the work.

A tract of land was chosen at the foot of the south slope of Canaan Mountain where conditions were fairly uniform. Fifteen rectilinear plots of five acres each were laid off, using a staff compass and steel tape for the survey. All boundary lines were marked with red paint and white twine was stretched over the painted lines.

The first plot was worked with a ten man crew and foreman; the second with 9 men and a foreman; another with 8 men and a foreman; and so on until a 3 man crew and foreman had worked their plot. The two and one man crews worked without a foreman.

A uniform procedure was followed for all plots.

The crew worked the plots the short way which generally followed the contours.

The designated spacing in line was eight feet.

In dropping a man from the crew between plots, the man dropped was chosen from the center of the line so that the original linesmen remained for all except the one and two man plots.

No rate of speed was designated, this being left to the discretion of the foreman.

Boundaries of strips were marked by paper trail in the usual manner.

The crew guided on the "pick up" man and in turning around at the end of the strip, pivoted on the end man, each crew man retaining for the new strip his same relative position in line that he occupied on the strip just finished.

No back checking was done. When part of the crew were engaged in pulling bushes the balance moved forward slowly until those pulling had caught up with the line.

When a heavy concentration of bushes was found all the crew helped pull and, when finished, reformed the line and moved forward again.

Two army trench picks were carried in a crew to assist in pulling large bushes.

The bushes pulled by the foreman were tallied separately.

Certain problems connected with the size of the crews, such as the difficulty of transporting and of obtaining board and lodging for large crews, effect on crew morale of large versus small crews, and other problems of a purely administrative character do not enter into this experiment which deals solely with the technique of eradication.

Although the plans called for plots presenting equal difficulties of topography, ground cover and other physical factors influencing eradication work, actually such areas could not be found. Consequently some method of weighting had to be resorted to in order to put the computations for the several plots upon a common basis. The first step taken was a preliminary survey of the plots by the observer, data men and foreman, all of whom had had enough

previous experience in handling crews to make an intelligent estimate of the time necessary for a five man crew to cover the area. They agreed upon the following classification:-

Very easy
Easy
Medium
Difficult
Very difficult.

Crews were assigned plots in such order as to more or less balance the varying degrees of difficulty. For instance a ten man crew worked a very easy plot and a very difficult one; a six man crew did the same; a three man crew worked an easy as well as a difficult plot; the medium plots were worked by crews of the other sizes.

When field work was completed the data was taken from the tally sheets and assembled in statistical tables for analysis. The data in these tables was worked over and arranged in an attempt to throw light upon the various factors making up eradication efficiency and time consumed in doing the work. Studies were made of the effect of ground difficulties and number and size of the Ribes present upon efficiency of the work and upon the time consumed in doing the work.

Our study of the data has so far failed to show that the eradication efficiency has been appreciably influenced by ground difficulty, crew size or number of bushes present on the area. The only measurable influence upon eradication efficiency that has been detected is that exerted by the size of the Ribes present. Our data strongly indicate that the eradication efficiency increases directly with the size of the Ribes present on the area.

The influence of ground difficulties on the time consumed has not yet been measured but it is reasonable to suppose that it will be very slight. The

rate at which the crew moves over the ground must necessarily be slow in order to permit the men to effectively search for Ribes as they progress, hence increased topographic and surface difficulties would tend only to require more physical exertion on the part of the men without materially lowering their powers of observation. It is true that on very steep slopes, cliffs, dense underbrush and bad swamps the walking speed would be seriously diminished but under ordinary circumstances such as those on the experimental area it is believed that the physical difficulties will prove to be negligible.

We found in the preliminary study of our data indications that the time consumed in doing the work increases directly with the number of bushes present on the area and also directly with the size of the crew used.

It is expected that further study of the data will strengthen the indication already brought out and that it will bring out the relationship of other factors to eradication efficiency and time consumed in doing the work. Among other possible relationships to be studied are:

1. Influence of the size of the Ribes bushes on time consumed in doing the work.

2. Influence of crew size on time lost.

The actual cost of the crews has been figured but a true comparison of the costs for crews of various sizes cannot be made until all plots are put upon the same basis as to physical difficulties, number and size of bushes present and possibly other factors not yet determined. Then, too, the time used by the crews must be weighted so as to compensate for the varying degrees of completeness of the eradication work.

This gives a fair idea of the scope of the experiment. Just how successful we will be in working out the desired information remains to be seen.

RECENT DAMAGE STUDIES IN NEW YORK

by
H. H. York
NEW YORK CONSERVATION COMMISSION

There is a regretable lukewarmness or indifference on the part of many individuals of real influence as to the seriousness of white pine blister rust and its control. This attitude of mind is due to the fact that these persons do not seem to realize that the control of this disease must be a very definite part in the future successful management of the white pine crop.

The control of white pine blister rust will necessarily involve the expenditure of a large amount of money in order to complete the initial eradication of Ribes from the white pine areas of the Northeast. It is therefore highly essential that we have definite data on the damage white pine blister rust is causing where control measures have not been applied.

During the summers of 1923, 1924, 1925, Dr. Walter H. Snell of Brown University has been employed by the Conservation Commission of Albany, N. Y., in making an intensive study of the damage white pine blister rust has caused in the heart of the white pine belt of New York. These studies were made almost entirely in one acre plots in typical stands of white pine in a north and south line of about 90 miles extending through Warren, Essex and Clinton Counties. Data compiled on twenty-four acres show that 23,340 white pine trees were examined. There were 21,853 cankers and 70,247 feet of Ribes leaf bearing stem in and within 300 feet of the plots. A conservative basis of damage was taken which is essentially as follows: (1) Number of trees found killed by blister rust. (2) Trees with stem cankers or with cankers within six inches of the stem. The following are some of the striking facts revealed. Seven percent of all the trees examined were dead. Seventeen percent on the basis of No. 2 as stated above, are doomed. The total of damage is 24 per cent.

Excluding a plantation of about eight acres which was studied, and one plot in which there were no Ribes, data on the remaining 15 acres of natural growth White pine are as follows: 13 percent of the trees were dead and 27 percent of the trees have cankers in or within six inches of the stem. The total damage is 40 percent. Other striking facts revealed are: There is almost a total lack of reproduction between the years of 1910-1920, during which time there were four big blister rust infection years. There is some young reproduction since 1919 when there have been no heavy infection years, unless in 1925 which seems quite probably, but which cannot be definitely determined before 1927 or 1928.

While it is not definitely known that the absence of reproduction between 1910 and 1920 is due to the seedling white pine being killed by blister rust, the fact that some reproduction has come in since 1919 indicates that such was the case. It is known that there were thousands of 1919 seedlings in 1920 in one of the areas which was studied. These seedlings have almost entirely disappeared. It is known that many of these were killed by blister rust.

The damage represented by 24 percent is based very largely on trees fifteen to twenty years of age. It is very evident that this figure does not represent the total damage thus far from blister rust. That Ribes and blister make the reproduction of white pine an absolute impossibility is a fact which we cannot escape and must be recognized for all time to come in the management of a crop of white pine.

The Northeastern United States is very largely the original home of the white pine. This section of our Country is agriculturally on the decline.

There are millions of acres of idle land in this section of our Country which once grew White pine and will do so again if only given a chance. Our whole program of forest conservation in the Northeast centers around the white pine. This tree is destined to be just as vital to the happiness and industrial welfare of many communities as corn and wheat are to other parts of our Country. It cost in New York in 1925 on the average of 88 cents to protect an acre of white pine from blister rust. The average cost to reforest an acre of land was $8 to $10 per acre. At our present rate of reforestation in the Northeast it will require more than 500 years to reforest all of the idle land. Nature will reforest much of this land with white pine if blister rust is kept away. The average cost of Ribes eradication is greater and the average cost of reforestation is less in New York then elsewhere in the Northeast. The average cost of Ribes eradication in New England is about twenty cents per acre while the cost of reforestation is about $15 per acre. The aim of blister rust control is really reforestation with a species of forest tree which has brought more of the comforts of life to the communities of the Northeast, than any other tree. Blister rust control demands the fullest possible support from every one who has an interest in forest conservation.

INVESTIGATIVE WORK IN THE OFFICE OF FOREST PATHOLOGY, IN 1925

by
Haven Metcalf
Bureau of Plant Industry, U. S. Department of Agriculture

No investigative work on the white pine blister rust, or rather none of consequence, has been done in the East during the past year. Routine notes on certain old experiments have been taken, particularly on those at North Conway, and considerable time has been spent in writing up results. These papers as published have been listed in the Blister Rust News, and will continue to be as they come out.

Work has continued in the West. The work on the pinion blister rust was brought to a tragic close by the sudden death in September of Prof. Ellsworth Bethel. He had been working since 1918 on this rust and had a large manuscript on the subject virtually completed. An effort is now being made to bring this manuscript to completion, and it will probably be published within the coming year. It is hoped that Prof. Bethel's private herbarium, which has been mainly collected in the years prior to his connection with this Office, may be acquired by this Office, as it is rich in early collections of Cronartium occidentale and other rusts which are scientifically significant or economically important. At the time of his death, Prof. Bethel was putting these collections in order and writing up his theories regarding the biology and distribution of the Rocky Mountain rusts. So far as can be judged now, nearly 20 papers that he left in a nearly completed condition can be salvaged and the essential facts published. Other manuscripts that are partially completed will have to wait critical study of his collections by some person yet to be assigned to the task. Many features of Bethel's life and work of interest to this audience will be published in a forthcoming biography of him

in Phytopathology, and to this attention may be directed for certain facts which might otherwise well be presented here.

Mr. Lachmund has presented an eleven-page report summarizing the investigative work on the white pine blister rust in the West since its inception. This document is so condensed and has such unity that it is impossible to abstract it, so instead of attempting to do so, the entire report is included. The discussion of the distribution of the rust in the West by Lachmund will be of particular interest to eastern readers.

"Before commencing my account of the season's investigations I should first like to explain the reasons for the present distribution of the rust. It will be remembered that this rust was discovered in the West late in 1921, raising at once a host of problems connected with the future of western white and sugar pines, and one of the first of these problems was the determination of the rust's western distribution. Little intensive study could be carried out in the short time remaining in 1921 but by the fall of 1922, due to the work of Mr. A. T. Davidson of the Dominion Laboratory of Forest Pathology, the limits of the range in British Columbia were well defined. These limits included the entire Coastal white pine belt on the mainland and the east side of Vancouver Island from Victoria to Rock Bay. One of the main factors in permitting Mr. Davidson and his men to cover these great stretches of country along the coast so rapidly was the cooperation of the Dominion Air Board, travel being accomplished largely by flying boat. Pine infection was located at numerous places from the International Boundary north to the head of Butte Inlet, from Vancouver east to Agassiz, and northeast along the Pacific Great Eastern Railway from Chee Kye to Birken. In the interior it was found at three places: Revelstoke and Canoe on the main line of the Canadian Pacific Railway and Beaton at the head of the Arrow Lakes, all in the interior white pine belt which extends northward from the Inland Empire region of Idaho, western Montana and eastern Washington. South of the International Boundary, intensive scouting by parties from the Office of Blister Rust Control revealed the presence of the rust on one pine at Blaine just south of the line on Puget Sound, Washington. This together with infection found in 1921 on two planted pines in a nursery at Mt. Vernon, also in western Washington, made up the known distribution of the rust on pines in the western United States at the end of 1922. In both cases infection was of comparatively recent origin, subsequent to 1916.

Coincident with scouting, studies were inaugurated by the Office of Forest Pathology at different infection centers from Vancouver north to Thurston Bay and from Chee Kye to Birken to determine the history of the rust at each center. These studies developed strong evidence that the rust

had become established at all of the older infection centers in 1913. At the same time Mr. Davidson discovered infection evidently of 1910 origin on 180 eastern white pines in a planting on Point Grey, B. C. These trees were all that remained of 1000 eastern white pine seedlings shipped from the Nurseries of Pierre Sebire and Son, Ussy, France, a locality in which the disease is known to have been present in 1910, and all evidence it has been possible to collect indicates that Point Grey was the place of original introduction of the rust to the West. In the Interior the rust evidently became established in 1917 or 1918. From a single point in 1910 then the range of the rust on pines widened in 1913 to include points north along the Straits of Georgia from Vancouver to Thurston Bay, from Chee Kye north to Mile 72-1/2 on the Pacific Great Eastern Railway and east, evidently to Abbotsford. In 1917 and 1918, infection was carried across the Interior Dry Belt, an area devoid of white pines separating the Interior and Coastal white pine regions, to become established on pines at Canoe, Revelstoke, and Beaton. In the Coastal Region it spread north to pines at the head of Butte Inlet, and, from indications from recent scouting, south probably to one or two points in the Puget Sound region. How did this spread following the original introduction occur? It could not have taken place from pine to pine. There were too many white pine bearing gaps between infection localities, and all other evidence with respect to direct spread had always been absolutely negative. It could not very well have been distributed artificially by the introduction of either host, for the infection centers are located in associations of native white pines and Ribes. It might have spread from currant to currant, overwintering on them as it went. These hosts are distributed all over the range of the pines. But spread from currant to currant is generally very limited and it would again have been difficult to explain the fact that the pines were infected over large areas separating the points at which pine infection became established in 1913 and subsequently. That the wide and rapid spread of the rust could be explained on the basis of wide dissemination of pine infecting spores from currants and gooseberries to pines was out of the question. These spores are very delicate and retain their capacity to cause infection even under the most favorable circumstances but a relatively short time. Consequently, pine infection is invariably confined within the near vicinity of Ribes. The only remaining alternative is that wide spread infection occurred by dissemination of the spores produced on the pines.

Since 1922 circumstantial evidence has accumulated which discards all other theories. This evidence is drawn chiefly from the data accumulated in the study of the yearly distribution of the rust on the currants and gooseberries. In 1922 the rust was found on cultivated black currants at many points in western Washington, decreasing in frequency from the Border south to Illwaco at the extreme southwestern corner of the state. This was over two hundred miles south of the infected pines in British Columbia. It should be stated here that the concentration of Ribes infection points in certain localities in the Puget Sound region made it appear probable that some pines had become infected and were producing spores in this section at the time; furthermore, that subsequent scouting had resulted in the discovery of a few infected pines at two places near Quilcene, approximately 100 miles south of Vancouver. On the other hand, there has never been anything to indicate that pine infection was within 100 miles of Illwaco, at the least.

In British Columbia the distribution outside the range of white pines was relatively very much limited. It was considered most important to concentrate scouting in the Interior where the main white pine stands occur and this section was thoroughly covered from the line of the Canadian Pacific Railway south to the Border. Inspection of black currants was also carried out in a number of places in the Dry Belt. The rust was found, however, only on cultivated black currants, all within twenty-five miles from known infected pines at Canoe, Revelstoke and Beaton. On this same host it was found up to about equal distances from some of the known infection centers in the Coastal Pine Region. The spread here may have been considerably greater, particularly north of the range of pines. This was impossible to determine since there was no opportunity to scout to the north, nor in much of the territory surrounding the known infection centers here in 1922.

In 1922 weather conditions were generally adverse for the infection and development of the rust on Ribes in the Interior and relatively unfavorable in the Coastal region. In 1923, however, these conditions were generally very favorable. The result was that the rust now appeared on these hosts in a greatly widened range. Cultivated black currants were found infected at most of the scattered places in which they occurred throughout the Dry Belt from the line of the Canadian Pacific Railway south into eastern Washington and on in the west Kootenay section of the Interior Pine region from this same line south along the Arrow Lakes to Nelson. Outside the range of infected pines along the coast the rust was found both on cultivated black currants and on several of the most susceptible wild Ribes as far north as Bella Bella 110 miles north of the range of western white pines and south in western Washington to Yelm in Thurston County at the foot of Puget Sound.

In 1924 weather conditions for Ribes infection were distinctly unfavorable and the range on these hosts was very much contracted and but slightly greater than in 1922 when the production of aeciospores (spores produced by the rust on the pines) must have been considerably lower.

In the Interior pine region infection was confined within relatively narrow limits of the pine infection centers at Canoe, Revelstoke and Beaton, with the southern limits here 90 miles north of those in 1923. In the Dry Belt it was found at only three places as against over forty in 1923. Of these three places, the southernmost was a full 90 miles north of the southern range in this section in 1923. As in preceding years, the rust in the Interior outside the immediate vicinity of the infected pines was confined to the cultivated black currants. In the Coastal region no sign of the rust could be found at Namu and Bella Bella north of the range of white pines where it was present in 1923, and to the south the range extended only to the southern end of the Puget Sound. Ribes infection here was generally much lighter and sparser than in 1923.

In 1925, early season conditions were ideal, with Ribes leaves well developed and succulent and with several very favorable moist spells just during the period that the bulk of the spores from the pines had matured and were being dispersed. There was also a very abundant production of these spores. The result was that the rust became distributed on Ribes over a greater range than ever before. It was found again at the numerous places where it had occurred in 1923 in the Dry Belt of British Columbia and in the interior pine region south again in the vicinity of Nelson, B. C. It reappeared at Illwaco where it had not been present since 1922 and was widely distributed thru the rest of western Washington. In addition, the rust appeared on cultivated black currants in the Cariboo District of the Dry Belt at scattered places north to Soda Creek, 150 miles farther north than it has ever been found before in this section. Likewise, in the Coastal region the range was extended 100 miles to the south when it was found for the first time in western Oregon. Cultivated black currants or the wild stink currants were found infected here at three different places, the farthest south being Pacific City. To the north, scouting was done this year only on the Queen Charlotte Islands and at Prince Rupert. Results here were negative. The section intervening between these places and the northern limits of white pines to the south, including the localities of Bella Bella and Namu, was not examined this year. It is quite probable in view of the spread elsewhere that infection was again present for a considerable distance north of the range of the pines here as in 1923.

While conditions were favorable for the spread of the rust to Ribes this year, they were decidedly not favorable for its subsequent development on these hosts. Following a propitious start, the season developed into an extremely dry one. The result was that intensification was generally light. This was particularly evident in our studies thru the Dry Belt and Cariboo Districts late in the season. Ribes nigrum was found infected in many plantings thru these sections but in practically all places except where the planting had been watered infection was light and usually centered in a definite group of leaves on one or two bushes indicating quite definitely the point of original infection around which subsequent slight waves of intensification had taken place.

Analyzing this data with respect to the method of spread, it is obvious that the theory of overwintering and spread by urediniospores (spores produced by the rust on Ribes which serve locally to intensify and spread the rust on these hosts but will not infect pines) can not be accepted. The presence of the rust 1923, its absence 1924, and reappearance 1925 at various places thru the Dry Belt, its reappearance after an absence of two years on the Illwaco Peninsula and at other places in western Washington, its distribution in Oregon and the Cariboo District all argue emphatically against this. Furthermore, spread by urediniospores can only be very limited in general when these spores fail to spread the rust thru even a small planting of the extremely susceptible cultivated black currant as they failed at many places where infection was found in the Dry Belt and Cariboo Districts. The presence of infection at these places indicates quite definitely that the whole country must have been showered by aeciospores (spores produced by the rust on the pines). Birds could have participated but slightly in this early dissemination.

The great majority of these spores are generally matured and liberated in the latter half of April and the first half of May. At this time the birds are following rather definite lanes of flight from south to north, one set in the interior and one in the coastal region. In the interior there are no infected pines to the south. There are likewise none south in Oregon. The character of infection at the various widely scattered plantings in the Cariboo District and the Dry Belt also contradicts any such possibility. As stated above, infection in most places focused in a definite point on one or two leaves. There was no general distribution of original infection points over a planting such as might be expected from a flock of spore-covered birds. Nor, for the same reason, and, furthermore, because infection was generally more or less of even age in these plantings, could birds have played much part in distributing the rust locally in these sections following the production of urediniospores. The same applies to man and animals. The only acceptible theory is that of distribution by wind-borne aeciospores. Unlike the urediniospores, which stick together, these spores are produced loosely and are easily caught and carried by the winds. They retain well their capacity to cause infection and it is easily conceivable that under favorable circumstances they might ride for great distances and still remain alive and vigorous.

The evidence presented by the western distribution of the rust during the years studied and before indicates the usual limits of spread from pine to currant to be about 150 miles. It is to be expected that the points at which Ribes will become infected in the outlying sections of the range will be scattered even in the most favorable of seasons. The chance that infection will be returned to the pines at such places depends entirely upon variable conditions. These include the proximity of the pines, the susceptibility of the Ribes bush or bushes diseased, the amount of spores produced which are capable of infecting the pines, and weather conditions at the time these spores may be produced. In nature a favorable period of precipitation and high humidity is essential. But even under the most advantageous of circumstances only a very slight fraction of these fragile pine infecting spores can ever live. Great numbers of them are produced during nights on which there are heavy dews, and in the warmth and brightness of the following day they lose all capacity to infect and soon die. Again the vast majority of them must fall on sterile ground. In any event, the history of the spread of the rust in the West shows quite definitely that most of these spot infections of Ribes, even when close to pines, may be expected to run the course of their season's development and die out without establishing the rust on the pines. On the other hand, any wide distribution of the rust such as that of the present season is almost sure under any circumstances to result in the establishment of a few new pine infection centers on the outskirts of the range. Once established on the pines at any locality, nothing short of the most energetic control measures can prevent the establishment of numerous new centers and a multiplication of the rust in the general vicinity within a comparatively few years. That is undoubtedly what will happen very shortly in the country surrounding Nelson at which place infection evidently became established on pines as a result of the rust's spread to Ribes in 1923.

In explaining to you the reasons for the present distribution I have gone rather deeply into the question of the methods of spread for the rust. This is one of our main studies. Its importance and the necessity for carrying it along for a number of years yet are obvious for we can not form final conclusions in the study of a variable like white pine blister rust on the basis of three or four years investigations any more than the weather bureau can establish its averages at any place from three or four years records.

Of our other studies, the most important are:

Study of the relation of Ribes with respect to their reaction to infection and capacity to produce spores capable of infecting the pines.

Study of damage to western white pines.

Distance of spread and commercial damage from Ribes to western white pine.

Relative susceptibility of the different species of white pines.

Influence of weather conditions and climate variations upon the development of the rust on both groups of hosts.

Development of means of differentiating white pine blister rust and pinion blister rust on Ribes.

Development of system in the collection of the data.

Relative Infection of Ribes

Considering first the study of Ribes reaction to the rust, the most urgent phase of this study concerns the relation of the species most important numerically as associates of the main bodies of western white pine in the Inland Empire region. These species are the prickly currant (Ribes lacustre), the sticky currant (R. viscosissimum), the white stemmed gooseberry (Grossularia inermis), and the wild black currant (R. petiolare). These species are being tested by inoculation within the range of the rust in the Dry Belt of British Columbia, some miles from Kelowna. This place was one of the localities on which cultivated black currants were heavily infected in 1923 and it is interesting to note here that during the present season we found infection of 1923 origin on a planted white pine near a black currant patch in this town.

The present test constitutes by far the most comprehensive systematic study of its kind ever attempted for white pine blister rust. It is giving good results. It will take some three months or more to compute and organize the data collected this year and last, so I can not give you figures at present. I can, however, state that the results this year confirm those of last year which indicate that the wild black currant and the white stemmed gooseberry will prove far more dangerous as associates of the pines than the sticky and prickly currants. The latter is generally very low in production of the late summer stage spores.

This study is particularly important to control measures for if on the basis of equal units of leaf area, one species is, let us say ten times more dangerous as a producer of pine infecting spores than another, it is quite apparent that it will be necessary to give greater attention to this species than to the less susceptible one in eradicating Ribes. The study must be continued and extended for several seasons yet.

In the study of the annual development of the rust data is being collected on the reaction of all species of Ribes encountered. Our data as compared with greenhouse tests show that for practical purposes the only adequate method of determining the relation of the species in their reaction to the rust is by studies in nature. The best bases obtainable in the greenhouse can do little more then establish alone whether a species is susceptible or whether it approaches immunity or is immune.

As rapidly as possible data is being collected upon the relative susceptibility and capacity to produce pine infecting spores for Ribes important as associates with sugar pine. Not all have been studied, but of those that have the studies indicate that all will be congenial hosts for the rust. These species are: red flowering currant (Ribes sanguineum), squaw currant (R. cereum), gummy gooseberry (Grossularia lobbii), and coast black gooseberry (G. divaricata). Red flowering currant and coast black gooseberry are particularly susceptible species.

Damage to Western White Pines

In the study of damage to western white pine the plots at Daisy Lake were again examined in October this year. Plot I covers one-third of an acre and contained 178 trees ranging from 5 to 50 feet in height with the majority 15 to 20 feet high. Growing under the pines are many stink and prickly currants, the former one the most susceptible of all species. In August 1922, 40% of these trees on this plot had been killed by the rust. About 90% were dead by the end of 1924. At present but 6 trees are living. The total number of cankers estimated to be present on these trees is 2700 and only one is given more than five years to live. This appears to be a relatively resistant individual. It is 40 feet high with a D. B. H. of 6.4 inches and shows relatively few cankers. It is still in thrifty condition.

An interesting result of the heavy infection conditions on and about this plot and in similar locations is the reduction of the amount of live stem in Ribes bushes due to repeated heavy infection and killing out or suppression of these plants by the rust. In 1924 there were on Plot I, 205 stink currants and 180 prickly currants with totals of about 2050 and 680 feet of live stem respectively. In October 1925 the number of stink currants had increased to 223 but the amount of live stem had decreased to about 1800 feet. Prickly currant with a total of 181 plants showed a reduction of live stems from about 680 to 530 feet.

Plot II covers two-thirds of an acre and contains 442 trees ranging from saplings a few feet high up to a few trees from 13 to 20 inches D. B. H. and 95 feet high. This plot is 100 feet from Plot I and large numbers of stink currants are present within 100 to 400 feet on this side of the plot. This is also a fair representation of the prickly currant overlapping the edge of the plot on this side. In 1924 none of the trees had been killed by the rust altho 97% were infected. This year 99% were infected and 55 or 12.5% had succumbed to the rust's attack. These killed trees ranged from 2 to 35 feet in height and averaged 11.5. Examination of this plot shows that the larger the tree the lighter is the degree of infection.

In order to determine what damage was likely to occur to the larger trees on Plot II, the majority of those over 80 feet in height were climbed. Twelve trees ranging from 80 to 95 feet in height were examined in this way. Of these twelve trees seven have cankers just entering or about to enter the stem as far as 15 to 25 feet down from the growing tip. One had a canker which will undoubtedly get into the stem 35 feet below the tip. Of the remaining four, only one seemed to have any chance of escaping such stem cankers within the next few years. The diameter of the trees at the lowest points at which stem cankers were entering or were threatened ranged from 4 to 7 inches. For the seven trees in which the establishment of these cankers is a certainty, the tops above the point of the canker may be expected to die within 4 to 8 years. This study should be extended to still larger trees in this and other localities.

Plot III covers one-fourth of an acre and contains 190 trees of about the same size as on Plot I. It differs from the latter in that it has no Ribes upon it and relatively few in its immediate vicinity. The heavy growth of stink currants is 300 yards away. It is also different from Plot I in that it is relatively more exposed. Plot I is largely covered by an open stand of alders and cottonwoods 80 to 100 feet in height which form a light crown canopy over the pines, while the stand of Plot III consists of rather open mixed coniferous reproduction in which white pine is competing as an equal. Infection on Plot III is relatively light because of the distance from the main body of Ribes and the relatively slight representation of these plants in the immediate vicinity. In 1923 when this plot was established it had only 42.3% of its trees infected, and in 1924 this had increased to 54.7%. This year the percent of trees infected is 59.

With respect to pine infection in general there has not since 1921 been a year in which conditions have been generally favorable for infection of the pines. It will be remembered that our studies have shown that in most of the heaviest infection centers the rust became established on the pines in 1913. A good deal of pine infection followed at these places in 1917 and 1918 and very heavy further intensification occurred in 1920 and 1921. In 1922 and 1923 intensification was relatively very light and the same will probably prove true of 1924 and 1925.

Coincident with this development there has been a considerable mortality among the cankers. The great majority of those of 1913 origin have now died out, having killed the branches on which they occurred and cut off their own food supply. The same is true for more than half of those springing from infection in 1917 and 1918. Likewise a good share of the 1920 and 1921 cankers are dead. This has been due partly to their own action, but more largely to the killing of the branches by cankers of earlier origin.

With death, many of these cankers and particularly the younger ones have become inconspicuous or even indistinguishable. Furthermore, many of the cankers of 1920 and 1921 origin which became apparent as distinct and separate entities in 1922 and 1923, respectively, have now coalesced with each other and with older cankers. As a consequence there seem to be fewer infections now than in either 1922 or 1923.

In consideration of damage apparent, there was in the spring little change from last fall. Later in the season and at present, however, the aspect in this respect at the rust concentration points, as on the da age plots, has become more striking than in any previous year. This is due to the fact that cankers of 1920 origin have this fall reaped their first large harvest of branches and small trees. Damage will undoubtedly be even more conspicuous next year as death from 1920 cankers progresses and killing from 1921 cankers swings into full force.

Heavy damage has as yet been limited to the points where large numbers of susceptible Ribes are present in immediate proximity to the pines. While this damage is confined to the smaller trees generally, indications are not lacking in places, such as on the plots noted above, that severe injury and even death will soon result to some of the trees up to as much as sixty-five feet in height. The evidence given above for Plot II, furthermore, clearly indicates that in such localities the rust will soon take out from 15 to 25 feet of the tops in trees up to 95 feet in height and probably larger.

With respect to pine infection in the interior, it will be recalled that in 1923 only a few cankers were present at each of the three infection centers, Canoe, Revelstoke and Beaton. While in general, as stated above, but relatively light infection of the pines has occurred since 1921, this has not been true for Revelstoke. Here in 1924 cankers appeared by the hundreds. Many were cut out by Mr. Davidson and his assistants in an effort to retard the spread of the rust southward thru the interior pine regions of British Columbia to Idaho. By mid-season, however, it became apparent that this was a hopeless task. Tallies of these cankers showed that 1922 was the year in which they originated.

This year tallies were again made in the same localities as last year. They showed that practically no infection had resulted to the pines in 1923. These pines were associated with cultivated black currants. Most of these bushes have now been removed. They were, however, present in both 1922 and 1923, and were infected more heavily in the latter than in the former year.

1922, then, was, contrary to the general rule elsewhere in the West, a decidedly favorable season for infection of the pines at Revelstoke. In 1923, on the other hand, conditions in this respect, generally adverse, were evidently particularly unfavorable at this place. Thus little change is apparent with respect to the disease on pines here since the examination of last year. No damage is yet apparent nor is it probable that much will be seen here for a considerable number of years to come, for as compared to infection in rust centers of the coastal region, pine infection at Revelstoke is still very light.

Distance of Damage to Pine

In 1923, L. H. Pennington noted in a considerable area between Chee Kye and Brackendale that infection was common on the pines, altho currants and gooseberries were of almost negligible occurrence. Studies at his suggestion on the area indicate that susceptible currants and gooseberries in large quantities one-half to over a mile distant became heavily diseased and caused this infection on the pines in several very favorable years, 1917, 1918, 1920, and 1921.

This has been the only clear-cut instance of this type, altho there are indications that such spread may have occurred to some extent in one or two other cases where exceptionally favorable conditions of a similar nature obtained.

No further evidence on this point has developed. This is due largely to the fact stated before that since 1921, so far as may be determined at present, there has not been a year in which conditions were generally favorable for infection of the pines.

Susceptibility of the Pines

Seedlings of western white pine (Pinus monticola), limber pine (P. flexilis), white bark pine (P. albicaulis), sugar pine (P. lambertiana), eastern white pine (P. strobus), and Himalayan pine (P. excelsa) are being grown to test their relative susceptibility to the rust.

Influence of Weather Conditions

This study is closely linked with every other element of the problem. It includes, among others, detailed notes on the production of fruiting stages upon both hosts and the collection and analysis of weather records with reference to these notes and to the data on the spread of the rust in general.

Means of Differentiating White Pine and Pinon Blister Rust

Studies on this problem have been carried out by two investigators of the Office of Forest Pathology in the East and results are now available. Dr. R. H. Colley of the Office of Madison, Wisconsin, has found that there

is no ready means of differentiating these rusts on Ribes from the spores produced on these hosts. Measurements of large numbers of urediniospores averaged, however, show that the length, thickness of the walls, and the ratio of the length to the width is usually slightly greater for the pinion rust than for the white pine blister rust. Mr. Glen Gardner Hahn at Washington, D. C., studying the question of whether there is any species of Ribes which when inoculated with these rusts will show in its reaction to them a difference sufficiently constant and distinct to distinguish one from the other, has found only one dubious possibility. This species, the wild red currant (Ribes triste) has in this investigator's greenhouse tests appeared to be immune to the pinon rust and a susceptible altho non-congenial host to white pine blister rust. Due to the latter factor and to the difficulty of propagating it in the greenhouse, he concludes that it is of but doubtful value as a differential host. However, this may not necessarily be the case, for in 1923 inoculation experiments were carried out in the open in an experimental plot of planted Ribes at Qualicum Beach, B. C., which indicated R. triste to be a very congenial species to white pine blister rust. The subject requires further study.

Conclusion

Numerous other studies incidental to those listed above are under way. These include canker tabulations, studies of the incubation period, squirrel damage, secondary parasites, damage to currants and gooseberries, etc. As soon as they develop substantial bases or can be computed the results will be given out. In all studies the aim is to systematize the work so that the data may be presented as far as possible in percentage figures.

M I S C E L L A N E O U S

GENERAL DISCUSSIONS

(a) "Ways and Means of Completing Initial Eradication of Ribes in Each State"

Frost: Maine figures to continue the same rate. Except to clean up by end of eight year period. Plan to expand to new territory next year.

Amadon: In New York it is a matter of finances. State, County and individual cooperation to determine amount of work to be done.

York: Increase and perfect educational activities.

Newman: Feels that New Hampshire town appropriations have reached peak. 39 out of 235 towns have never appropriated. Only general educational work performed in these towns. Towns completed mean decrease in funds. Largely a matter of finance in New Hampshire. Fivaz asked Newman the number of new towns appropriating in New Hampshire in 1925. There were seven.

Ross: In Vermont the policy is to give everybody a chance to cooperate. If cooperation is not secured after two or three chances, let prospects temporarily alone and move to new fields. Before the completion of the program, these recalcitrant owners will be visited again. Work to date has been chiefly confined to Connecticut River Valley.

Newman: Asked Ross as to town cooperation where towns fail to appropriate year after year. Ross believes it best policy to let them alone and give them publicity over the state and after a few years results would come. Cites case of much infection being found in a town and no cooperation was secured. 12 individuals in adjoining town cooperated-less infection present.

Ross: Believes that all cooperators should be urged and informed that eradication is not going to make their pine free from disease as it is already there. Agents should be careful in bringing up this feature to explain it thoroughly.

Riley: Possibility of doing too much follow-up work. Should leave delinquent towns alone for a while

Newman: Cites case of where two or three men rule town.

Perry: Feels same as Ross about non-cooperators. Problem in Mass. has been largely with owners of cultivated Ribes and large tracts.

Riley: Main hope to complete program is to do more individual cooperative work.

Amadon: Thinks Ross' policy best. In New York some of the big men are hardest to obtain. After cooperation of these men is obtained, they are usually the best boosters. Believes agents should keep after these big men.

Filler: Really boils down to matter of judgment and common sense.

Newman: Believes agents should continue educational and service work in spite of reverses.

(b) --- "Need of Follow-up Work After Initial Eradication of Ribes:

Amadon: Main point is ignorance of need for re-eradication. No figures available. In New York the areas eradicated during the past three years will not need re-eradication for at least four or five years and that a competent scout will serve the purpose. Some areas at North Hudson no doubt should be re-eradicated by crew method due to inefficient crew work in initial eradication. Initial eradication in N. Y. a big problem with present allotment of State and Federal funds.

Riley: Believes a good scout could do necessary re-eradication work if done soon enough after initial eradication. Mentions study by Endersbee in Conn.

Amadon: Mentions that in N.Y. the foremen have special training as to proper method of pulling bushes. Proper pulling of bushes resolves question to one of seeding. Seed studies being conducted in N. Y.

Posey: Basis of re-eradication will be gound which had most Ribes in initial eradication. Should keep such records. No data ready on re-growth of Ribes in study at North Hudson.

Frost: Policy in Maine is to push ahead and to do no re-eradication until initial eradication is completed. Worst areas outside present districts.

Dr. Spaulding: Asked by man who had 2000 acres protected how soon he should have his land re-eradicated. Should expense be borne by Government?

Riley & Filler: State policy should determine this.

Frost: Cites case of Mr. Sewell in Maine who is located outside of present agents' districts furnishing crew and State paid for foreman.

Filler: Thinks problem is to get definite data on conditions in areas worked and requests that ways and means be outlined. Asks if we are doing justice to cooperators if we do not aid them in re-eradication problem.

Frost: These men already educated under Maine plan.

Filler: Thinks there is a real need for determining conditions.

Newman: Data on effectiveness of initial eradication--cites conditions in town where very few bushes were found in two years.

Fivaz: Work on Darrowsville area (suggested by Amadon) mostly on pine infection.

Filler: Suggests that each state conduct a survey to determine need of re-eradication.

Merrill: Asks what Federal policy is.

Filler: At present on eight year program. Cannot go beyond that.

Merrill: Pine areas in Vt. mapped by towns. Data by projects kept on Ribes and plotted. This will give some idea of amount of work needed.

Filler: Asks if there is enough of this kind of data.

Anderson: Map of R.I. showing pine stands and initial Ribes data. Doubts practicability for other states. Re-eradication is being carried on continually in R.I.

Merrill: Policy in Vt. is to get individuals to do all re-eradication.

Riley: Suggests some sort of inexpensive survey to determine question of re-eradication. Suggests such a study be carried on in conjunction with the Federal Government.

Merrill: Thinks it is up to individuals.

Frost: Believes re-eradication work is entirely up to individuals.

Riley: Not question of who should do work but when it should be done.

Frost: Rather see the Federal Government start this.

Sheals: Re-eradication to be continued in R.I. for next two or three years.

Corliss: Thinks it is state problem and they should furnish data to Government, who in turn should make it available for use.

Newman: Good opportunity for data in N.H. but lack of funds handicap.

Riley: Believes experiment conducted 6 or 7 years after initial eradication best.

Ross: In favor of assistance from Northeastern Experiment Station. Possibility of good data. State leaders could often do some of this work themselves.

Dr. Spaulding Over-taxed with work at present. Best basis for data if extracted from state offices.

Riley: Original data will determine possibilities of re-eradication data. Study already made in Connecticut.

Filler: Endersbee's study by strip line method. Suggests same method for each state.

Newman: Have figures for area of 170 acres 1917 work re-eradicated in 1921. Good data and fair criterion.

Corliss: Moves that the matter be referred to the committee of state leaders and Mr. Filler. Motion carried.

(c) "Development of Effective Cooperation With State Extension Directors in Blister Rust Control Work."

Newman: State Director of Extension Kendall, of New Hampshire, will be at Forestry Congress. Director Kendall is deeply interested and has cooperated extensively in blister rust control work.

Detwiler: Cooperation with State Extension Service similar to that with State Foresters except that the shoe is on the other foot. We should keep the Extension people informed from time to time of the progress of our work. Simply a matter of our being so wrapped up in our work that we occasionally forget to keep them informed.

Newman: Sends one copy of monthly analysis report to State Director of Extension. Also sends copies of notices of meetings, etc., or phones. Feels that N. H. has wonderful cooperation with Extension Forces. This

is a big factor in success of control work in state. Has been brought into closer contact with Extension people by Junior Forestry program. Director Kendall stresses value of farm woodlot.

Riley: Good idea to write quarterly letter to Director of Extension. Better than sending monthly analysis report which is mass of detail.

Frost: Sends monthly summary (BRE2a) and two copies of annual report to Director of Extension.

Perry: Agrees with Riley. Has refrained from sending monthly analysis report because of too much detail.

Anderson: Has always sent Professor Stene monthly analysis report.

Amadon: Contact with State Director of Extension in N.Y. through Assistant Director - gets reports through County Agricultural Agents. Sends monthly reports and copy of annual report to State Director of Extension. Relations very cordial. Rather contact be made that way than by transmitting letter.

Dr. York: Always extends invitations to Mr. Taylor, Leader County Agricultural Agents, and Extension Forester to attend blister rust activities.

Newman: N. H. in much the same situation as N. Y. regarding contact with Extension Service.

Filler: Asks if leaders consider the monthly analysis report sent out by the Boston Office worthwhile. Tables a record and not for comparison of work in different states. Should compare average with averages for all states.

Perry: Recommends that analysis report be discontinued as it did not justify the time spent preparing it.

Frost: Feels same as Perry regarding analysis report. Wants BRE2a sent to all agents.

Anderson: R.I. not vitally concerned - certainly looks over report.

York: Always reads analysis report and much interested.

Frost: Great benefit from BRE2a report.

York: Believes blister rust control agents should have something of the sort.

A motion was made that this matter be referred to the special committee- carried.

Merrill: Asks how many hours the agents should report on their itineraries.

Filler: Actual hours worked.

REPORT OF STATE LEADERS COMMITTEE

The committee consisting of the several State Blister Rust Leaders and Mr. E. C. Filler, to whom were referred several matters discussed at the general session of the Conference reported as follows:

1. Federal Reprint of New York Blister Rust Poster

Voted that no action is necessary by the federal office in the matter of the reprinting of the New York blister rust poster, the states to procure any copies that may be needed, by placing an order direct with the producer in New York State.

2. Tag - "Pine Lot Protected"

Voted, that the idea of using a tag to be posted on pine lots protected against blister rust is an added educational feature that is worth trying out on a small scale to determine its value. The sample as presented is approved as to wording, size, etc.

Orders for Tag

Anderson, (R.I.)	100
Holder (Vt.)	100
Frost (Me)	200
Riley (Conn.)	100
Amadon (N.Y.)	100
Perry (Mass.)	100
Newman (N.H.)	100

3. Definition of an Interview

Voted, that the following be accepted as the standard definition of the term "Interview": "An interview is a conversation whose purpose is to secure the eradication of Ribes or general support for control work."

4. Cooperation with Boy Scouts

It is the concensus of opinion that cooperation with the Boy Scout organization is desirable. Voted, that we approve of cooperation with the Boy Scouts along educational lines by furnishing them instruction in general forestry, particularly relating to white pine, in the identification of Ribes and the characteristics of blister rust and by assisting in their hikes through the forests. We feel that such training will enable the Scouts to be of service in the development of an enlightened public opinion favorable to blister rust control work as one of the important phases of forest conservatio It is our opinion, however, that it will be unwise to utilize the services of the Scouts in eradication of Ribes except under special conditions where it may be desirable to cooperate with local troops. This opinion is based upon the belief that their immaturity and inexperience in such work, coupled with the impracticability of furnishing them with adequate supervision, makes it undesirable to have them participate in this phase of blister rust work. We further believe that the fact that Scouts would only be available for temporary and limited periods seriously limits their usefulness for this work.

5. Need For and Character of Re-eradication:

It is agreed that practically our entire attention must be devoted to our problem of initial Ribes eradication but that it is also evident that there is a real need for more definite information on such subjects as the re-growth of Ribes, damage by LBS, mortality of seedlings, etc., to aid in the determination of the time and methods for re-eradication.

As to the character of possible re-eradication work, this cannot be defined until more adequate information on Ribes ecology has been obtained. It is essential, however, that an effort be made in each state at once to bring the records of Ribes eradication work into proper shape that they may be used in the planning of surveys for meeting the re-eradication problem.

For the Committee:

(signed) E. C. Filler, Chairman
C. C. Perry, Sec'y.

Report accepted by Conference.

Orders for Trail Paper - (2" square).

Holden (Vt.) - - - 100 lbs. per agent to be shipped to agents

Frost (Me.) - - - - 50 lbs. " " " " " " "

Riley (Conn.) - - - 200 lbs. to the Experiment Station.

Amadon (N.Y.) - - - 50 lbs. per agent to be shipped to agents.

Newman (N.H.) - - - 1 ton shipped to Concord.

Perry (Mass.) - - - 50 lbs. to agents Clave, Endersbee, Wheeler, and McNerney.

BLISTER RUST RESOLUTION PASSED BY THE SECOND NEW ENGLAND FORESTRY CONGRESS

Springfield, Mass., Dec. 9-12, 1925.

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BLISTER RUST

Whereas the Second New England Forestry Congress recognizes that White Pine Blister Rust Control Work is highly essential and a fundamental part of forest conservation wherever White Pine grows,

BE IT RESOLVED, that the Congress of the United States be urged to make possible the adequate continuance of the present effective program of Blister Rust Control work to meet the present serious emergency.

A T T E N D A N C E

L. E. Newman	c/o State Forester, Concord, N. H.
Dr. L. H. Pennington	Syracuse University, Syracuse, N. Y.
Neil Violette	State Forestry Department, Augusta, Me.
W. O. Frost	" " " " "
C. C. Perry	Room 136, State House, Boston, Mass.
A. F. Amadon	Conservation Commission, Albany, N. Y.
J. M. Ocrliss	State Forestry Department, Concord, N. H.
F. M. Callward	Extension Service, Burlington, Vt.
S. V. Holden	Box 472, Burlington, Vt.
K. B. Barraclough	Farm Bureau Office, Exeter, N. H.
W. J. Cullen	" " " Rochester, N. H.
R. M. Ross	Commissioner of Forestry, Montpelier, Vt.
H. Henry Knowles	Gloversville, N. Y.
E. W. Littlefield	Conservation Commission, Albany, N. Y.
R. M. Hutchinson	Saratoga Springs, N. Y.
O. C. Anderson	Room 129, State House, Providence, R. I.
D. G. Rankin	Hudson, N. Y.
C. E. Baker	Lewis, N. Y.
G. E. Stevens	Box 127, Lowville, N. Y.
J. D. Kennedy	Hudson Falls, N. Y.
B. H. Nichols	Lewis, N. Y.
Dr. A. W. McCallum	Experiment Farm. Ottawa, Can.
Dr. Perley Spaulding	Northeastern Forest Experiment Station, Amherst, Mass.
Dr. G. P. Clinton	Agricultural Experiment Station, New Haven, Conn.
Philip W. Ayres	4 Joy St., Boston, Mass.
Shirley W. Allen	The American Forestry Association, Washington, D. C.
W. O. Filley	Agricultural Experiment Station, New Haven, Conn.
Dr. H. H. York	Conservation Commission, Albany, N. Y.
R. T. Edwards	American Tree Association, Washington, D. C.
W. J. Endersbee	81 Grove St., Great Barrington, Mass.
R. E. Wheeler	719 Bridge St., West Springfield, Mass.
R. B. Craig	719 Bridge St., West Springfield, Mass.
J. E. Riley, Jr.	Agricultural Experiment Station, New Haven, Conn.
P. H. Merrill	State Forestry Dept., Montpelier, Vt.
E. C. Filler	408 Atlantic Ave., Boston, Mass.
S. B. Detwiler	Office of Blister Rust Control, Washington, D. C.
Dr. J. F. Martin	" " " " " " " "
G. B. Posey	" " " " " " " "
A. E. Fivaz	Box 51 Warrensburg, N. Y.
R. A. Sheals	Room 129 State House, Providence, R. I.
H. A. Reynolds	4 Joy St., Boston, Mass.